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THE DWARF MISTLETOE IN NEW ENGLAND.

Arceuthobium pusillum, Peck, the dwarf mistletoe, is without doubt one of the most interesting plants in our New England flora. As a flowering parasite it is, we believe, unique for this region in germinating directly upon the host-plant. Its parasitism is therefore unusually continuous and undoubtedly of long standing, — a fact shown both by the absence of green coloring-matter and by the extreme reduction of the leaves, which appear only as scale-like rudiments. It is probable that the dwarf size is also a characteristic acquired after the development of the parasitic habit, since as parasitism advances the stem as well as the leaf ceases to have its usual physiological significance and, except in cases like the dodder where the stem functions as a running rootstock, it is apt to decrease in length and even disappear altogether as in parasites like Apodanthes or Rafflesia, in which the flowers are essentially sessile upon the host-plant. *Arceuthobium pusillum* is also interesting from the fact that it is in the northeastern United States an outlying representative of the large and chiefly tropical family of the *Loranthaceae*, to which belong also the true mistletoe of Europe, *Viscum album*, L., and the false or American mistletoe, *Phoradendron flavescens*, Nutt. The latter plant occurs from New Jersey to Ohio, Missouri, and southward. The tropical members of the family, of which there are more than five hundred species, exhibit by their yellow-green and olive-brown color all stages in the degeneration of their assimilative tissue. Some of them have, however, unlike our northern species, rather large and showy flowers.

Through the kind co-operation of Messrs. von Schrenk, Jack, Jones, Eggleston, and Fernald, who have made independently a number of almost simultaneous discoveries relative to the dwarf mistletoe, it is possible to present at one time the following papers which greatly

extend the records of the species. We are also indebted to Mr. C. E. Faxon for his detailed drawings, and to Mr. F. Schuyler Mathews for the skillful retouching by which the photographs have been prepared for half-toning.

NOTES ON ARCEUTHOBIUM PUSILLUM.

HERMANN VON SCHRENK.

(Plate 12.)

IN the latter part of the year 1871, Mrs. Lucy A. Millington found a small mistletoe on the black spruce, *Picea Mariana*, B.S.P. (*P. nigra, Ait.*) at Warrensburg, Warren County, New York and about the same time Prof. C. H. Peck discovered the same plant at Sandlake, Rensselaer County, New York. Specimens were sent to Dr. Engelmann who recognized in the plant an *Arceuthobium* which he called *Arceuthobium minutum*.[1] Much astonishment was expressed at the time that this curious plant had not been found before, and we find numerous accounts of it in the periodical literature of that day.[2] Collectors searched for new stations with great zeal and a number of these were found in New York (notably in Sullivan County), in Pennsylvania, and in New Hampshire. The mistletoe in all these localities was confined to the black spruce, growing in cold sphagnum bogs. Peck described the plant in 1872, as *Arceuthobium pusillum*.[3]

For many years nothing more was heard of the plant. A number of species, many of which had extended ranges, were found on various Coniferae in the far west. Recently the interest in this, the smallest of the mistletoes, revived and several observers report finding it in localities not known before, from Vermont, Massachusetts, and Maine.

During the past summer a group of white spruces on Monhegan Island (near Boothbay Harbor), Maine, was found covered with the Arceuthobium. The trees were much stunted, some of them were dead, and the living ones formed a striking contrast to their healthy neighbors, because of their short yellow leaves. It was thought rather

1 Bull. Torr. Bot. Club **2**: 43, 1871. Proc. Acad. Sci. St. Louis **3**: LXXXIII, 1873 (presented May 20, 1872).

2 Bull. Torr. Bot. Club **2**: 42, 47, 48, 1871; **3**: 24, 55, 1872; **4**: 15, 44, 1873. Proc. Acad. Sci. St. Louis **3**: LXXXIII, 1873. American Naturalist **6**: 166, 406, 1872.

3 Peck, C. H., 25 Ann. Report State Botanist, N. Y., p. 69, 1873.

odd that the mistletoe should occur on an island at least five miles from the nearest mainland, and a vigorous search was made on the coast of the mainland for the plants. Hundreds of trees were found about Boothbay Harbor and Linekin, on which the mistletoe grew in quantities. The trees attacked varied from such as were but a few feet in height to the tallest in the forest, often eighty feet in height. The affected trees all grew within an eighth of a mile of the shore. This local distribution is probably due to the fact that an atmosphere laden with moisture is necessary in order that the seeds may be properly discharged. The fogs which are so prevalent during the months of August and September bring about these conditions, which will be most favorable near the coast.

As the accounts which have appeared up to this time give but short and scattering notes, a brief description of the plant may be of interest. In the unpublished notes of Dr. Engelmann, there are many drawings and descriptions, made at the time when the plant was discovered, which will be published, together with a fuller account of the plant and its western allies, in a more extended form.

The mistletoe is usually found on the younger branches of the spruces.[1] Many stems grow out from the host branch, sometimes twelve to sixteen stems in an inch. The individual stems vary between wide extremes as respects size and color. Both characters depend so much on the vigor of the host branch that this variability is to be expected. On very strong branches the stems are dark brown, almost black, and vary from half an inch to an inch or more in height. On weaker branches the plants are paler in color, and usually have a more spindling shape. The vigor of the host plant is, however, not the only factor, exposure to the direct rays of the sun, the number of stems in a given length of the host stem, and probably other factors determine the character of each stem. One finds strong, dark-colored stems in the midst of a dense broom, and, again, very pale ones.

The influence of the *Arceuthobium* on its host is probably the most marked feature of this interesting plant. In many cases where a parasite attacks a host-plant, the latter reacts in one way or another, as if stimulated. Increased growth takes place, new tissues and organs are formed, which are in striking contrast to the normal habit of the host. *Arceuthobium pusillum* stimulates its host to a greater degree

[1] In the following, by spruce, *P. Canadensis*, B. S. P. (*P. alba*, Link), will be understood.

than its western relatives do theirs. The stimulus takes the form of an increased growth, both in length and in the number of branches. This growth is of two kinds. If a seed germinates on a weak branch, which is shaded or much crowded, the affected branch grows to be several times its normal length. After several years a very open system of branches has resulted. The lateral branches of the spruce are but one or two inches apart; but on a large branch affected with the mistletoe, the points where lateral branches leave the main branch are often eight to twelve inches apart. Where a seed falls on a vigorous branch a very different form of branching results. Two stages of this are represented on the accompanying plate. The small branchlet nearest the germinating seed assumes a vertical position, and grows abnormally long during the first year. The next year several branches appear at its base, and both the main shoot and these fringing branches shortly give rise to others. After several years a very decided clump of branches grows in the form of a small bush, standing vertically on the horizontal branch. The small bush or broom gradually appropriates the food supply of the branch, and that part of the main branch beyond its base gradually weakens and dies. Thus it may happen that ultimately the broom appears to be at the end of a strong branch. These brooms grow to be very large. On some of the tall spruces several were measured which were two feet wide and four feet high. A tall spruce covered with these brooms is truly a strange object.

The leaves of the lengthened stems as well as those on the brooms are very much shorter than the normal spruce leaves, and paler in color, often quite yellow. The age of the brooms varies with the vigor of the host tree. The brooms when once they cover a tree are a great strain on its vitality, and it very soon weakens and dies. Dead trees with the old brooms are surprisingly numerous on that portion of the Maine coast alluded to. That this seemingly obscure plant is very destructive to the spruce is evident. After the parasite has once obtained a foothold in a group of spruces, it will not be long before all are affected, thanks to the effective bombardment of their branches by the small fruit mortars.

The manner in which the seeds are disseminated differs but little from that recently described by MacDougal.[1] A fact which Mrs. Millington speaks of in a letter to Dr. Engelmann is the way in which

[1] MacDougal, D. T. Seed dissemination and distribution of *Razoumofskya robusta* (Engelm) Kuntze, Minn. Bot. Studies 2 Series, pt. II, p. 169, 1899.

the stems bend toward the newer branches as the seeds ripen. This was very marked on the spruces about Linekin. Towards the latter part of September, the stems became inclined towards the outer part of the tree. This brought the axes of the berries into a line almost parallel with the branch upon which the plants grew, i. e., with the ends from which the seeds were to fly toward the outside of the tree. The last week in September, the berries were ripe, and every day the seeds were shot out, flying out upon the newer branches. The manner in which the spirally marked hairlike cells glue the seeds to the bark will later be described more in detail.

The longitudinal arrangement of the stems on a branch has given rise to the supposition that they spring from longitudinal rhizomes, which grow in the bark of the host. This system of rhizomes is a very complex one. A network of threads grows out from the base of each stem, one thread fusing with another before long. From these threads the actual absorbing organs, the haustoria, are developed much as in the true mistletoes.

The distribution of this mistletoe is an interesting one. There seems to be little doubt now that birds in some cases carry the seed from place to place, for they must have carried them to Monhegan Island. Its occurrence in moist swamps and along the coast has been alluded to, and it is to be hoped that collectors in the New England States will watch for the plants, that we may be able before long to establish a complete chain from its furthest western to its most eastern station. Specimens will gladly be supplied on application.

SHAW SCHOOL OF BOTANY.

EXPLANATION OF PLATE 12. — Fig. 2. Horizontal branch of white spruce, *Picea Canadensis*, B. S. P. (*P. alba*, Link) with very young witches' broom. The latter is two years old. Note the strong buds on the branches of the broom, both terminal and lateral. About one-fourth natural size. Fig. 1. Older witches' broom of the white spruce. The stems of the Arceuthobium cover the branches, but are too small to be visible in the photograph. Note how the terminal part of the main horizontal branch is dying, also how the main stem of the broom is now thicker than the original host branch. Note the length of the annual growth of the broom branches, compared with that of the host branch. About one-fourth natural size.

ARCEUTHOBIUM PUSILLUM IN MASSACHUSETTS.

J. G. Jack.

(Plate 13.)

Until the spring of 1898, the only localities in New England in which the so-called Small Mistletoe, *Arceuthobium pusillum*, had been found and reported by botanists were Lebanon and Canaan, New Hampshire, where it was collected by Prof. H. G. Jesup in 1883, and the station near Shelburne, New Hampshire, discovered in September, 1885, by Professor W. G. Farlow. It has been long known in the Adirondacks in New York State, and has been found in Pennsylvania.

It is only during the past two years that several new stations have been added to the range of the plant in New England, and further investigation will probably show it to be more generally distributed than is commonly supposed.

In the course of an examination of some lands appropriated by the Metropolitan Water Board, in the region about Boylston, Massachusetts, for the purpose of establishing the Wachusett Reservoir, and increasing the water supply for Boston and adjacent towns, I found this little parasite upon the Black Spruce, *Picea Mariana* (*P. nigra*, Link) growing in a small sphagnous swamp less than a mile north of Boylston station on the Massachusetts Central railroad. It is two and a half miles from West Boylston station or almost half-way between it and the Clinton station and nearly in a straight line between the two, close to the point where the Boylston, Clinton and Sterling township lines adjoin, most of the swamp being in the latter township. The location is approximately thirty-five miles west of Boston.

This swamp is about three hundred and seventy-five feet above sea-level and the area covered by Spruce affected by the Mistletoe is not more than six or eight acres in extent. In no case were the spruces more than twenty feet in height, averaging less than half that stature and especially dwarf on the more boggy or "quaking" parts of the swamp. With them were associated small Red Maples, Larches, Alders, Andromedas, *Kalmia angustifolia* and *Kalmia glauca*, *Gaylussacia resinosa*, and other trees and shrubs usually found in such situations, besides trailing cranberries, pitcher plants, etc.

The mistletoe was first discovered upon the spruce branches on April 21, 1898. It was then apparently in full bloom, the yellow

anthers of the staminate plants causing them to be much more conspicuous than the pistillate plants, which are not so likely to be noticed in flower unless sought. The date of flowering is interesting because in botanical publications it is usually given as June. When the plants under consideration were again examined on May 9 the staminate flowers had nearly all faded away. They are brownish and composed of a usually three- or four-parted calyx, upon each segment of which a sessile anther is borne, which is the most conspicuous part of the blossom when the yellow pollen is exposed.

This mistletoe is dioecious and the staminate and pistillate flowers are usually found on separate spruces or host plants, but sometimes on different branches of the same tree.

At maturity this little parasite rarely approaches an inch in length; most commonly it is less than half an inch long, the pistillate or fruiting plants apparently averaging longer than the staminate. The stems are greenish or greenish brown, slender, cylindric, usually less than a sixteenth of an inch in diameter, generally simple, sometimes with short opposite branches.

The stems are practically biennial, attaining full growth during one season, flowering and fruiting the next, after which they fall away and only the stem scars remain on the bark of the host. The staminate plants fall away in spring or early summer, soon after flowering, the pistillate not until after maturing of fruit in the autumn.

The mistletoe spreads with the growth of the twigs by means of haustoria or suckers beneath the bark of the host, and, in the autumn, small dark buds may be seen protruding through the bark of that portion of the twig which grew the preceding year, these developing into full sized plants the following year, having well developed flower buds which open the succeeding spring; so that the living plants of the parasite, in some stage, are to be seen in three growing seasons before they finally drop off.

In the autumn the fruiting mistletoe is found on the fourth year of growth back from the tip, while the plants for the next year occupy the next later growth or that of the third year preceding.

In this latitude the fruit ripens in the latter part of September. It is then of a translucent dull purplish color.

When ripe, the seeds are violently expelled from the berries at the moment that the latter become separated from their stalks, and a mucilaginous matter attached to the seeds causes them to stick to other

parts of the host or other plants in the vicinity, upon which they germinate, under favorable conditions.

The manner of seed expulsion in this genus, as seen in some western species, has been described by D. T. MacDougal in Minnesota Botanical Studies, 2nd series, part ii., February 22, 1899, p. 169–173.

No opportunity was obtained for observing the actual expulsion of seed from the Boylston plants, but this was seen very well in fresh specimens growing on white spruce in Maine, kindly furnished by Dr. Hermann von Schrenk.

The mistletoe at Boylston, as yet the only known locality for it in Massachusetts, is now nearly extinct, and will soon be completely eradicated, because, in the summer of 1898, the host-plants and other trees and shrubs were cut and burned to clear the ground for surveyors, and only a few small fragments of the mistletoe-bearing host escaped alive. These will soon be obliterated, because the swamp is to be filled or thoroughly cleaned out, and the pure waters of the reservoir will eventually flow over it.

This *Arceuthobium* may be found in other localities not far away. In looking for it, the hunter will be aided by the fact that the affected host-plants often appear distorted or stunted in comparison with perfectly healthy trees.

In the accompanying plate, generously furnished by Mr. C. E. Faxon, the figures have been drawn from specimens growing on black spruce collected in the Boylston locality.

Arnold Arboretum.

Explanation of Plate 13.—*Arceuthobium pusillum*, Pk. Fig. 1, branch of black spruce in spring, with staminate Arceuthobium in flower; *a*, twig one year old; *b*, twig two years old; *c*, twig three years old. Fig. 2, branch in autumn with pistillate plants and fruit; *a*, twig one year old; *b*, twig two years old showing buds of the parasite; *c*, twig three years old with full-grown Arceuthobium; *d*, twig four years old with fruiting plants. Fig. 3, plant with mature fruit. Fig. 4, staminate plant in flower. Fig. 5, pistillate plant in flower. Fig. 6, staminate flowers. Fig. 7. pistillate flowers. Fig. 8, the same in vertical section. Fig. 9, fruit, showing manner of dehiscence and seed expulsion. Fig. 10, seed. (Figs. 1 and 2, natural size; figs. 3 to 10, enlarged.)

Arceuthobium pusillum on a new host in Vermont.—I have been confident for several years that *Arceuthobium pusillum*, Pk., must occur in Vermont. The black or swamp spruce, its usual host, is common in the sphagnum swamps of the Champlain valley and elsewhere in the state. Professor Peck finds the Arceuthobium in the Adirondack

regions, and Professor Hudson, of Plattsburgh, told me last year that he had found it a few miles south of that city, near the shores of Lake Champlain.

Persistent search on the Vermont side of the lake failed to show the parasite until this summer. Mr. W. W. Eggleston, of Rutland, wrote me in June that he had at last discovered it in a spruce swamp near that city. Early in August I visited a large black spruce swamp on the south end of the Alburgh peninsula, which divides the northern end of Lake Champlain into two arms. Here, at last, my own search was rewarded. A considerable per cent of the black spruce trees showed abnormal growths or "Hexenbesen" (witches' brooms). These abnormal branches, in all cases examined, were hosts of the Arceuthobium. No flowering or fruiting specimens of the parasite were observed at this time.

Upon again visiting the swamp the last week of September to obtain these, a similar "Hexenbesen" was observed in a medium-sized specimen of the tamarack, *Larix Americana*. Examination of this revealed scattering plants of Arceuthobium upon the deformed branches. The relative number of these upon the tamarack in proportion to the size of the "Hexenbesen" was small, however, probably not above one per cent of that found upon similar spruce branches. The individual plants of the parasite were of about the size and appearance of those found on the spruce. No fruiting plants occurred.

Time did not permit of much further search, and no other "Hexenbesen" was observed on tamarack. A photograph of the infested tamarack branch was made and is communicated with this article.

A number of herbarium specimens were taken of the parasite as it occurs on spruce, and I shall be glad to send these upon request to botanists who are interested in this curious plant. — L. R. Jones, Botanical Laboratory, University of Vermont.

Explanation of Plate 14. — Witches' broom formed on *Larix Americana* as a result of the parasitism of *Arceuthobium pusillum*; from a photograph.

Further notes upon the distribution and host plants of Arceuthobium pusillum. — When the 6th edition of Gray's Manual was published in 1889, the tiny parasite *Arceuthobium pusillum* was known only from the Adirondacks, Hanover, New Hampshire, and Pocono Mountain, Pennsylvania. It now appears, however, to be

rather common in the northern half of New England, and the fact that it has been so long overlooked is doubtless due on the one hand to its small size, and the other to its peculiar mode of growth upon branches of trees and often out of reach. At Hanover, New Hampshire, it was discovered by Professor Jesup, and grew upon the black or swamp spruce (*Picea nigra*, Link). Knowing the plant well at that station, some ten years ago, the writer has since spent much time in searching for it in Vermont, and was finally rewarded, May 6, 1899, by finding a new station at Pittsford, Rutland county. It was there growing on the black spruce in a small swamp, which had been searched several times before.

In June the writer found the Arceuthobium again on Bald Mountain, Mendon, at about 2,200 feet altitude, and in this case upon the red spruce (*P. rubra*, Link).

Prof. L. R. Jones' interesting discovery of the species at Alburgh, Vermont, on the black spruce, and later upon the tamarack (*Larix Americana*, Michx), is described in his article published above.

President E. Brainerd has since found the Arceuthobium on the black spruce at Ripton, Vermont, and Prof. C. E. Peck tells me that it has been sent to him from the Adirondacks this fall on the branches of the white spruce (*P. alba*, Link). Although it has thus been observed upon no less than four species, the writer believes that it occurs chiefly on the black spruce. — WILLARD W. EGGLESTON, Rutland, Vermont.

ARCEUTHOBIUM PUSILLUM IN THE ST. JOHN AND ST. LAWRENCE VALLEYS. — Late in September last, while crossing a low spruce swamp near Fort Kent in northern Aroostook county, Maine, the recollection of Dr. von Schrenk's interesting discovery of the dwarf mistletoe in the southern part of the state occurred to me, and I thought: "Why shouldn't I find *Arceuthobium*, too?" Instantly, upon looking up, I saw a sickly black spruce loaded with the small fruiting parasite. The plant covered many of the small black spruces; but though the white spruces, firs and hackmatacks were carefully examined, none of them seemed to harbor the mistletoe. Nor was any strong tendency to *Hexenbesen* seen in the affected trees, such as has been noted in other regions by Dr. von Schrenk and Professor Jones. The only marked effect of the parasite upon the host-trees was a tendency to produce unusually slender branchlets and yellowish foliage.

In other swamps of the region the formula was repeated which preceded my discovery of *Arceuthobium*, but the charm seemed to have vanished, for I was unable to induce more of the mistletoe, or any *Scolopendrium* or other plants which I thus sought, to appear before me. Later in the week, however, I drove through a spruce-swamp several miles south of Fort Kent, in the Swedish town, Upsala, and there several of the trees were dying from the effect of the little mistletoe. These stations are interesting as giving a considerable northeastern extension of the recorded range of the parasite.

The French and English people at Fort Kent, to whom I showed my treasures, expressed little surprise, for, according to them, branches bearing the plant are frequently brought in by woodsmen. One woman, whose observations upon the native plants are generally accurate, stated that at a grand mid-winter ball at Tadoussac, at the mouth of the Saguenay, she had seen many of the women wear in their hair the twigs covered with the purplish brown fruit. Whether they realized that the little plant was a mistletoe and whether it had with them the traditional significance of the European plant, she could not state.— M. L. Fernald.

NOTES ON ALGAE,—II.

Frank S. Collins.

A few species of marine algae, new to this region, have been noticed lately; they are mostly inconspicuous plants, as is to be expected in a region whose marine flora, not exceptionally rich in species, has been so long studied; and it is probable that of such minute species, many still remain for future discovery.

Phormidium persicinum (Reinke) Gomont, with extremely slender filaments, barely 2μ in diameter, forms a thin, pink film on shells, mostly on the Spirorbis which is often attached in great abundance to larger algae, especially *Fuci*, *Laminariae*, etc. In the present case the Spirorbis was on *Rhodymenia palmata*, found floating at Nahant, Mass., in June, 1899. The species was described by Reinke, as a Lyngbya, in the Algenflora der Ostsee, p. 91; the description is reproduced, under Phormidium, at p. 184 of Gomont's Monographie des Oscillariées.

Chlorochytrium Schmitzii Rosenvinge, a green alga of very simple structure, occurs among the erect filaments of such algae as *Cruoria pellita*, in which it was first found by Rosenvinge; it is described and

figured in Grønlands Havalger, p. 965, fig. 56. The writer found it scattered rather sparingly among the filaments of *Petrocelis cruenta* J. Ag., at Seal Harbor, Mount Desert, Maine, in July, 1899.

In company with the last-named species was another green alga, *Codiolum Petrocelidis* Kuckuck, Wissentliche Meeresuntersuchungen, New Series, vol. i, p. 259, fig. 27. The two are not likely to be confounded, as the Codiolum is drawn out below into a slender stipe, while there is no stipe in the Chlorochytrium. The history of this alga is rather curious. It was described and figured in 1865 by Cohn, in Rabenhorst, Beiträge zur Kentniss und Verbreitung der Algen, Heft 2, p. 33, but under the supposition that it was a rudimentary state of a Cladophora. It is referred to by Farlow in the Manual of the New England Marine Algae, in 1881, but without a name. In Hedwigia, vol. iv, p. 125, 1886, Wollny incorrectly referred it to *Codiolum gregarium*, and it received a name of its own only in 1894, twenty-nine years after it was described and figured, quite accurately.

Ralfsia Borneti Kuckuck, Meeresuntersuchungen, vol. i, p. 245, fig. 15, was found by the writer at Seal Harbor in July, 1899, growing on a small pebble below low water mark. There was nothing external to distinguish it from the common *R. verrucosa*, but the free filaments accompanying the unilocular sporangia are very slender below, the lower cell being even twenty times as long as broad, and nearly, if not quite, colorless; the upper cells are shorter than broad, with dark chromatophors. The plurilocular sporangia, described by Kuckuck, were not found; they are quite different from anything found on our American species of Ralfsia.

Rhodochorton parasiticum Holmes, seems to be not uncommon on Laminaria from Cape Ann, north. The writer has found it on *L. longicruris* and on *L. digitata*, especially on the larger forms of the latter, with flattened stipe. When well developed, it covers the stipe with a dense red plush. It resembles *R. Rothii* Naeg., common on rocks along our coast; but the basal filaments, instead of forming a horizontal layer, penetrate rather deeply into the substance of the host.

Ulothrix variabilis Kuetz. var. *marina* Wille, has been found by Isaac Holden in brackish water at Bridgeport, Conn. It has slenderer filaments than any other of our marine Ulothrix, 5–7μ diameter; it has been distributed as No. 615 of the Phycotheca Boreali-Americana.

In the Bulletin de la Societé Botanique de France, vol. xlvi, Gomont describes two new species of Plectonema, occurring within

our limits. *P. calothrichoides*, p. 30, Pl. I., figs. 6–10, was found, in company with various other *Schizophyceae*, by the writer at Nahant, Mass. The trichomes are from 2 to 2.5μ in diameter, with short articulations; the sheath, quite thick and dark colored in the middle of the filament, becomes extremely thin and colorless at the extremities, giving a Calothrix-like appearance, though the trichome does not taper.

P. Golenkinianum, p. 35, Pl. I., fig. 11, founded on a plant growing in a tank at the Biological Station at Naples, was found also in a mass of various minute algae, growing on overhanging rocks, Eagle Island, Penobscot Bay, Maine. The stratum is of a rosy or brownish red, the trichomes even thinner than in *P. calothrichoides*, 1.2 to 2μ diameter, the sheaths of uniform thickness.

These two species have been distributed in the Phycotheca Boreali-Americana, under Nos. 604 and 603 respectively.

There have been some algae recently distributed in the Phycotheca, from New England localities, as new forms or varieties; for the purpose of removing any doubt that might exist of the validity of descriptions, published only in labels, they are here reproduced.

Calothrix fasciculata forma **incrustans** Collins. *C. Contarenii* Collins in Bulletin Torrey Bot. Club, vol. xviii, p. 336, 1891; not of Bornet & Flahault. On rocks in littoral zone, Revere Beach, Massachusetts, September 29, 1895. No. 561. Filaments slenderer than in type, .008–.012 mm. diam.; habit like *C. Contarenii*; forming a smooth incrustation on rocks, so dense that it can often be stripped off in the same way as *C. pulvinata*.

Vaucheria piloboloides var. **compacta** Collins. Mystic River Marshes, Malden, Massachusetts, September, 1897. No. 477. Forming a plush-like mass among Salicornia, etc., on ground overflowed at high tide only. Habit like *V. Thuretii* Woronin; the stratum so dense that large sheets can be cut out with a knife, and lifted up. Dimensions of filament as in typical *V. piloboloides*; oogonia and antheridia as in type, except that the oospores are usually spherical, but sometimes lentiform; oogonia and antheridia scattered over the filaments, not in any apparent definite relation to each other.

Ectocarpus confervoides (Roth) Le Jolis, forma **brumalis** Holden. On muddy turf of Spartina roots, near high water mark, Charles Island, near Milford, Connecticut, December 25, 1898. No. 576. A winter form; fronds mostly 1–2 cm. long; main filaments about .025 mm. diam.; branches .012–.020 mm. diam. Plurilocular sporangia varying much in shape, from cylindrical to shortly conical; length sometimes over .15 mm.; width .015–.025 mm.; often curved

and distorted; either sessile or terminal on a branch of one to many cells. Unilocular sporangia unknown.

Fucus vesiculosus forma **gracillima** Collins. Among Spartina, etc., on muddy bank between tide-marks, Eastham, Massachusetts, September, 1888. No. 578. With oospores. A very slender form, without vesicles, and with receptacles linear to filiform. It is probably only a growth form, but unlike most of the dwarf forms of this species, it fruits freely.

The Walking-fern in Worcester County, Massachusetts. — In the October issue of Rhodora (p. 181.) Mr. T. O. Fuller reports the occurrence of *Camptosorus rhizophyllus*, Link, at Needham, only a few miles from Boston. He quotes also a statement that this is the only reported station for this local and highly characteristic fern east of Mt. Tom, or more properly of Mt. Toby. However, although hitherto unrecorded in print, there is a station in Worcester County in the town of Brookfield. At this place the species is scarce and grows, as usual, in crevices of rock, with every appearance of an indigenous plant. This new and intermediate station although only a few miles to the eastward of Mt. Toby, still diminishes somewhat the gap between the previously known stations, and therefore renders the indigenous nature of the Needham occurrence a little more probable.

In connection with the *Camptosorus*, I may mention another fern, which is extremely local in Massachusetts, namely, *Pellaea atropurpurea*, Link. This is given in the Amherst Catalogue only as occurring at Mt. Toby. It has, however, been found sparingly at a solitary station in the town of Berlin, Worcester County, growing upon a ledge containing a small percentage of lime which is characteristic of certain parts of the Nashua Valley formation. It is interesting to note in connection with the occurrence of this species at Berlin, the relationship of the substratum to its distribution. — G. E. Stone, Agricultural College, Amherst, Massachusetts.

SOME NORTHEASTERN SPECIES OF SCIRPUS.

M. L. Fernald.

In a recent preliminary discussion[1] of the "wool-grasses" it was shown that in the northeastern states there were two very distinct specific types which had long been confused as *Scirpus Eriophorum*. Since that time a large amount of material has been furnished by Dr. K. M. Wiegand, of Cornell University, showing a third species which is abundant in western New York, and during the past year field observations of the plants were carried on by the writer in southwestern New Hampshire, and a very exhaustive study of the group in Vermont has been made by President Ezra Brainerd. Specimens and critical notes have also been prepared by Mr. O. A. Farwell in Michigan, by Mr. C. H. Bissell in Connecticut, and by several others who have kindly placed at the disposal of the writer the results of their studies. In this more extended examination of the "wool-grasses" special aid has been rendered by the discriminating observations and criticisms of President Brainerd of Middlebury College.

From these more detailed studies it seems probable that, in the desire to avoid too radical a treatment of the plants, the northern *Scirpus cyperinus*, Kunth, was erroneously called a variety of the southern *S. Eriophorum*, Michx. The latter species, when mature, is of a pale terra-cotta brown, having a decidedly reddish tinge; and the sheaths of its involucre and involucels are for the most part of a deeper shade of the same color. The rays of the umbel are mostly ascending, but the numerous raylets are slender and drooping. The spikelets are usually in 3's, the middle one sessile, the two outer on more or less elongated pedicels. This plant, characterized by its terra-cotta color and slender-pedicelled spikes, is abundant on the southern coast of the United States extending north into New Jersey. Southward it matures in late July and August, but in Virginia its "wool" becomes conspicuous in September.

The common northern plant, *Scirpus cyperinus*, which in the former treatment was called a variety of *S. Eriophorum*, seems now, from a study of material from many localities, to be so clearly distinct from the southern plant as to warrant its recognition as a species. When

1 Contrib. Gray Herb. n.s. XV. (Proc. Am. Acad. xxxiv. 498). See also synopsis in Rhodora, i. 137.

mature the wooly inflorescence is of a dull brown color with little or no suggestion of terra-cotta or reddish. The sheaths of the involucels are generally a sepia or dark brown, and of the involucre a slightly paler tint. The raylets of the umbel are much less drooping than in *S. Eriophorum*, often very stiff and ascending, and the spikelets are all sessile in glomerules. In New England this species matures its fruit in late August and early September. The two extreme forms described as varieties *condensatus* and *Andrewsii* of *S. Eriophorum*, have their affinities much more with the northern *S. cyperinus*.

The other species, first definitely called to the attention of the author by Dr. Wiegand, proves to be abundant in the Connecticut Valley, and from there westward to Michigan and Wisconsin. It is essentially as stout as *S. cyperinus*, but in color the mature inflorescence is a pale yellowish brown, and the rays and raylets of the extremely dichotomous umbel are more slender and flexuous. The ultimate involucels with brown, not terra-cotta sheaths, bear small umbels of from 2 to 5 spikelets, the central spikelets sessile, the others on slender pedicels. Thus in habit this northern plant with yellowish-brown inflorescence somewhat resembles the stouter southern terra-cotta colored *S. Eriophorum*. In addition to its difference of color and stoutness, the northern plant has shorter bristles, 5. mm. long, those of the southern plant averaging 7. mm. long.

In Virginia *Scirpus Eriophorum* is mature in September, but its northern representative with the pale yellowish-brown wool is fully mature in New England and New York in late July and early August.

The following forms of this group are now recognized in New England.

Scirpus cyperinus, Kunth, Enum. ii. 170. *S. Eriophorum*, Michx., var. *cyperinus*, Gray, Man. ed. 2, 501; Fernald, Proc. Am. Acad. xxxiv. 501. — Common throughout, mature in late August and early September.

S. cyperinus, var. **condensatus.** *S. Eriophorum*, var. *condensatus*, Fernald, l.c. — Same range as species but less common.

S. cyperinus, var. **Andrewsii.** *S. Eriophorum*, var. *Andrewsii*, Fernald, l.c. — Originally from Southington, Connecticut: recently collected at East Middlebury, Vermont, Sept. 11, 1899 (*Ezra Brainerd*).

S. pedicellatus. Tall (1.8 m. or less in height) and stout (culm, just below the involucre, 2 to 4 mm. in diameter): leaves 0.5 to 1 cm. wide: inflorescence resembling that of *S. Eriophorum*, with more slender unequal rays, but with none of the primary umbellules

elevated far above the others; the involucre and involucels brown not terra-cotta at base: spikelets ovoid-oblong, 4 to 6 mm. long, from 2 to 5 in clusters at the tips of the filiform flexuous branchlets, the middle spikelet sessile, the others slender-pedicelled: scales brown or yellowish-brown; bristles pale brown, 5 mm. long. — A characteristic plant, the northern representative of *S. Eriophorum*. Alluvial marshes and thickets, from the Connecticut Valley to Michigan and Wisconsin. Specimens examined: — NEW HAMPSHIRE, Walpole, Aug. 2 (over-ripe), 1899 (*M. L. Fernald*, Herb. Alstead School Nat. Hist. no. 1): VERMONT, North Hero, July 30, Aug. 6 (over-ripe), 1899; Knight's Island, Aug. 6 (over-ripe), 1899; Lake Dunmore, Aug. 15 (over-ripe), 1899; Woodbury, alt. 460 m., Aug. 22, 1899 (*Ezra Brainerd*): NEW YORK, Ithaca, July 11, 1893, July 15 (over-ripe), 1894, July 25 (over-ripe), 1895 (*K. M. Wiegand*): MICHIGAN, Troy, (*Houghton*): WISCONSIN, Alma, 1861 (*T. J. Hale*).

S. PEDICELLATUS, var. **pullus**. Rays somewhat more unequal than in the species: spikelets duller brown and longer, 7 to 10 mm. long. — VERMONT, along Otter Creek, Middlebury, Aug. 11 (over-ripe), 1899 (*Ezra Brainerd*): MASSACHUSETTS, Williamstown, Aug. 9, 1898 (*J. R. Churchill*).

S. ATROCINCTUS, Fernald, l. c. 502. — Throughout New England, northward and westward, mature in late June and July, or in the mountains in early August. A very pale form, rather more lax than the type and with weaker coloring in the sheaths, has been collected in New Hampshire, Vermont and Michigan.

S. ATROCINCTUS, var. BRACHYPODUS, Fernald, l.c. 503. — Range of the species, but more common northward and at higher altitudes.

S. ATROCINCTUS, var. **grandis**. Taller (1 to 1.8 m. high) and stouter throughout than the species; culm just below the involucre often 2 or 2.5 mm. in diameter: leaves 4 to 7 mm. wide: inflorescence generally longer than in the species, 2 or 3 dm. long, rays very unequal, some of the primary ones far overtopping the others: spikelets oblong, 7 to 10 mm. long, grayish brown. — NEW HAMPSHIRE, Alstead, Aug. 9, 1899 (*M. L. Fernald*, Herb. Alstead School Nat. Hist. no. 2): VERMONT, Middlebury, Creek Road, Aug. 11, 1899, Battell's Pond, Aug. 17, 1899 (*Ezra Brainerd*). An anomalous plant, from its coarse habit, somewhat brownish color, and rather late-flowering season suggesting a possible relationship with *S. pedicellatus*; but with the black involucre, grayish tinge in the spikelets, and elongation of some of the primary rays so characteristic of *S. atrocinctus*.

While collecting and studying this group of species some other *Scirpi* have been found which are undescribed or ordinarily misinterpreted. One of these, which so far as yet known is confined to the Connecticut Valley, was discovered in 1881 in Vermont, by the late Edwin Faxon and it has since been collected in that state by President

Brainerd, and in New Hampshire by the writer. It is a very handsome and unique plant, not closely related to any described species. In its achene it is near the *Scirpus Eriophorum* group, but the bristles are much shorter and less crinkled, and inconspicuous in the fruiting plant, in this character approaching *S. lineatus*. In its ascending stiffish rays and raylets, however, it is unlike any of those species. From the very dark color of its spikelets this plant may be called

S. atratus. Culms tall, 1 to 1.75 m. high, rather slender (just below the involucre averaging 2.15 mm. in diameter) : leaves averaging 7 (5 to 9) mm. wide : involucre black or black and chestnut-brown at base : inflorescence 1 to 2 dm. high, occasionally producing branches from lower sheaths ; umbel of many dichotomous rays of various lengths, 2 to 4 of them more elongated and ascending, the others shorter, somewhat divergent ; the raylets slender but stiff, scarcely drooping : spikelets oblong-lanceolate, about 8 mm. long, sessile or subsessile in clusters of from 2 to 6 : scales oblong-ovate, acute or obtusish, below pale or reddish-tinged, above blackish with a slight ferrugineous tinge : achene 1 mm. long, pale, 3-angled, obovate-oblong : bristles about 2.5 mm. long, curling when dry. — In a wet thicket, Alstead, NEW HAMPSHIRE, July 30, 1899 (*M. L. Fernald*, Herb. Alstead School Nat. Hist. no. 3). Formerly collected at Sutton, VERMONT, Aug. 11, 1881 (*Edwin Faxon*), and at Ripton, VERMONT, July 17, 1898 (*Ezra Brainerd*).

A common "bulrush" of northern New England and the region about the Great Lakes has been known in our floras as *Scirpus sylvaticus* var. *digynus*, Böckeler, or *S. microcarpus*, Presl. The history of the treatment of this common northeastern plant and its immediate congeners is interesting.

In 1828, Presl described his *Scirpus microcarpus*,[1] a plant with the "habit of *S. sylvaticus*," and with bifid style, the type specimens coming from Nootka Sound (west coast of Vancouver Island), and from Mulgrave (on Bering Straits). In 1836 Torrey, apparently unacquainted with Presl's species, described in his monograph[2] *S. lenticularis* from the "North-west Coast of America, near Observatory Inlet, *Dr. Scouler*," remarking that it is "nearly related to *S. sylvaticus* but differs in its larger spikes, lenticular nut, diandrous flowers, and bifid style ; that species [*S. sylvaticus*] having shorter spikes, a triangular nut, triandrous flowers, and a 3-cleft style." For *S. sylvaticus* he cited three stations : "Canada, *Michaux* ; Hudson's Bay Country, *Dr. Richardson* ; Island of Sitka, Russian America, *Mertens*,"

1 Presl. Reliq. Haenk. i. 195. 2 Ann. N. Y. Lyc. Nat. Hist. iii. 328.

observing, however, that "I have seen no North American specimens of this plant except those in Michaux's herbarium, which I did not examine with sufficient accuracy for determining whether they are identical with the *S. sylvaticus* of Europe." Thus in view of Torrey's note it seems that there was little left at that time to stand for the Linnean *S. sylvaticus* in America.

In the first edition (1848) of the Manual, Dr. Gray gave no recognition to any American form of this group but the well-marked *S. atrovirens*, Muhl. In the second edition (1856), however, *S. sylvaticus* was clearly described with a 3-cleft style and six bristles, but the range given was "N. New England and northward," and *S. atrovirens* was included under it as a variety. This disposition of the plants was followed until the fifth edition (1867) when *S. atrovirens* was reinstated as a species and the range of *S. sylvaticus* was given as "Base of the White Mountains, New Hampshire (*Oakes*), and northward." In a note Dr. Gray then added that "*S. microcarpus*, Presl., *S. lenticularis*, Torr., apparently a form of *S. sylvaticus* with a 2-cleft style and flat achenium, approaches our northwestern borders." Shortly thereafter, apparently in 1868, finding, as his pencil note indicates, that the Oakes specimen from the "base of the White Mountains" had lenticular achenes and four bristles, Dr. Gray marked upon the sheet "not *Scirpus sylvaticus*, L., but *S. microcarpus*." This seems to have been the first recognition of a plant in the east with these characters, so well known in the northwestern species.

Böckeler, in his monograph, two years later (1870), included *Scirpus sylvaticus* as a North American plant, but of *S. lenticularis*, Torr., he made the variety *digynus* [1] citing no specimens.

In the sixth edition (1889) of Gray's Manual, Böckeler's varietal name was taken up for the northeastern plant which in former editions had passed as true *S. sylvaticus*, *S. microcarpus*, Presl, being cited as a synonym: the name *S. sylvaticus* was at the same time rightly applied to a conspicuous plant which is common from Massachusetts southward, but which for some unaccountable reason seems to have escaped earlier recognition.

Prof. Britton was apparently the first to give *Scirpus sylvaticus* and the common plant of northern New England and Canada, with its 2-cleft style, recognition as a distinct species. In 1892, in his list of the species of *Scirpus*,[2] he considers the northeastern plant identical

[1] Böckeler, Linnaea xxxvi. 727. [2] Trans. N. Y. Acad. Sci. xi. 74.

with the Pacific coast *S. microcarpus*, and in the Illustrated Flora the same name is given it. That the northeastern species, passing as "*S. microcarpus*," is clearly distinct from *S. sylvaticus*, there can be no doubt. The latter is a coarser plant, with conspicuously broader leaves and more ample inflorescence. The spikelets are rarely more than six or eight in a glomerule (generally fewer), and the rays of the umbel are ordinarily much more elongated. It has a uniformly 3-parted style and three stamens and usually six bristles, and the larger achene is darker colored and with a distinct ridge or angle on the back. This plant, the true *S. sylvaticus*, is of decidedly more southern range than the other, barely reaching southern Maine and New Hampshire, and from there extending southward to the Carolinas. In its flowering season, too, as shown by the dates on eighty herbarium labels of the two species, it is about *three weeks later* than the more slender northern plant.

Although the slender northeastern plant agrees with the northwestern and Pacific coast *S. microcarpus* in having 2-cleft styles and four bristles, and whitish barely angled achenes, there is little else to suggest their identity. The true *S. microcarpus* is as coarse a plant as the eastern and European *S. sylvaticus*. Its leaves are broad and its inflorescence ample, with long often flexuous rays. The spikelets are solitary or in glomerules of from 2 to 8. The upper sheaths of the plant in all the specimens examined are green or very slightly reddish tinged, and it is stated by those who know the plant in the field that in fresh plants there is no striking color in the upper sheaths. The more slender eastern plant, on the other hand, is quickly recognized by the deep purplish-red band at the base of each sheath, although this same color is occasionally seen in the otherwise dissimilar *S. sylvaticus*.

The northeastern species, from the apparent constancy of this marking, may be called

S. rubrotinctus. Stem slender or rather stout, 4 to 9 dm. high: leaves smooth, 4 to 13 mm. wide, the upper equalling or slightly exceeding the umbel; the sheaths conspicuously colored with red or purplish brown; involucral leaves mostly 3, the longest sometimes exceeding the umbel: rays of the umbel numerous, the 3 to 5 longest ones 0.5 to 1.5 dm. long, stiff, ascending, subequal, the many shorter ones ascending or spreading; the branchlets and ultimate branchlets of the inflorescence stiff, not flexuous: spikelets 4 to 6 mm. long, ovate-oblong to cylindric, in glomerules of from 3 to many; scales

ovate, blunt, finely suffused with green and black: stamens 2: style 2-cleft: achene obovate, short-beaked, plano-convex on the back, whitish, 1 mm. long: bristles 4 (rarely 5), retrorsely barbed nearly to the base. — *S. sylvaticus*, Gray, Man. ed. 2, 3, 4, 5 as to range, but not description. *S. sylvaticus*, L., var. *digynus*, Wats. & Coult. in Gray, Man. ed. 6, 581, and most American authors, not Böckeler. *S. microcarpus*, Britton, Trans. N. Y. Acad. Sci. xi. 81, for the most part, and Britton & Brown, Ill. Fl. i. 269, mostly, not Presl. — The common representative of the *sylvaticus* group in the northern states and Canada. New Brunswick, Grand Manan, July 30, 1891 (*J. R. Churchill*): Quebec, Gaspé Basin, July 24, 1882 (*John Macoun*, no. 68); Natashquam River, July 14, 1895 (*Sinclair Kennedy*); Roberval, July 27 (over-ripe), 1892 (*G. G. Kennedy*): Ontario, Port Stanley, June 22, 1882 (*John Macoun*): Manitoba, Lake Winnipeg Valley, 1851 (*Bourgeau*): Assiniboia, Swift Current, June 27, 1894 (*John Macoun*, no. 7536): Maine, Foxcroft, July 18, 1895 (*M. L. Fernald*, no. 301); Southport, Aug. 7, 1894 (*M. L. Fernald*), and abundant throughout: New Hampshire, White Mts. (*Oakes*, *Boott*, *Faxon*, et al.), ascending to 1300 m. on Mt. Clinton (*Kennedy & Williams*); Fitzwilliam, June 18, 1894 (*E. F. Williams*): Vermont, Willoughby Lake, July 4, 1854 (*Wm. Boott*); Mt. Mansfield, Aug. 22 (over-ripe), 1880 (*C. G. Pringle*): Massachusetts, Medford, July 7, 1867 (*Wm. Boott*); Milton, June 5, 1890 (*G. G. Kennedy*); Canton, June 4, 1880 (*E. Faxon*); Dedham, June 17, 1891 (*W. P. Rich*): New York, Danube, Herkimer Co., July 15, 1863 (*C. F. Austin*): Michigan, Keeweenaw Co., Aug., 1890 (*O. A. Farwell*, no. 549a): Colorado, 1874 (*W. A. Henry*); Oak Creek, Fremont Co., 1873 (*T. S. Brandegee*): Utah, Wasatch Mts., July, 1869 (*S. Watson*, no. 1215).

S. rubrotinctus, var. **confertus.** Rays of inflorescence short: glomerules compacted into dense clusters 1.5 to 4 cm. in diameter. — Green, Maine, July 10, 1878 (*F. Lamson-Scribner*). A dense-headed extreme parallel with *S. cyperinus*, var. *condensatus*, and *S. atrocinctus*, var. *brachypodus*.

S. sylvaticus, L., var. **Bissellii.** Spikelets linear or linear-oblong, 7 to 10 mm. long, in dense glomerules: sheaths conspicuously reddened below as in *S. rubrotinctus*. — In a swamp at Southington, Connecticut, July 22, 1898, no. 716, July 6, 1899 (*C. H. Bissell*); July 23, 1898 (*Luman Andrews*). An extremely long-spiked form with the sheaths more brightly colored than in the species, suggesting *S. rubrotinctus*: in its 3-cleft style, pale brown definitely angled achene, and other floral characters, clearly an extreme form of *S. sylvaticus*. In its development of long narrow spikes this plant exhibits a tendency which is paralleled in other species of *Scirpus* — as *S. cyperinus*, var. *Andrewsii*, *S. pedicellatus*, var. *pullus*, and *S. atrocinctus*, var. *grandis* described above, and *S. polyphyllus*, var. *macrostachys*, Böckeler (*S. Peckii*, Britton).

Gray Herbarium.

TYPICAL GOODYERA REPENS IN NEW ENGLAND. — In RHODORA, i. p. 6, Mr. Fernald has separated our northeastern form of *Goodyera repens*, R. Br. with broad white borders along the veins of the leaf, as var. *ophioides*. The typical form, with somewhat larger leaves and dark veins, seemed to be restricted to alpine and extreme northern regions of both continents, though reported also from the slopes of Pike's Peak and from a few other stations in the Rocky Mountains. But we have now to record its discovery in New England and New Brunswick. It was collected on Mt. Kineo, Maine, Aug. 28, 1895 (in fruit), by Mr. J. G. Jack; on the Nepisiguit River, New Brunswick, in August, 1898, by Mr. G. U. Hay; and at Ripton (alt. 1300 ft.), Vermont, Aug. 9, 1899, by the writer. Specimens from the first and last stations are in the Gray Herbarium. — EZRA BRAINERD, Middlebury, Vermont.

HUDSONIA ERICOIDES IN NEW HAMPSHIRE. — I was surprised to learn from Dr. Robinson's list of New England *Cistaceae* (RHODORA, i. 212), that *Hudsonia ericoides*, L., has not been reported from New Hampshire. I have in my herbarium a specimen collected June 7, 1892, by Mr. H. E. Sargent at Concord, New Hampshire, an occurrence noteworthy, not only as the first recorded in this state, but as furnishing an inland station for a maritime plant. A portion of the specimen has been sent to Cambridge for deposit in the Gray Herbarium. — WILLARD W. EGGLESTON, Rutland, Vermont.

[Since the receipt of the above note, specimens of *Hudsonia ericoides* from the same locality have been exhibited to the NEW ENGLAND BOTANICAL CLUB by Mr. F. W. Bachelder, who reports the station as covering a considerable tract of rocky ground. — ED.]

AT the annual meeting of the New England Botanical Club, held December 1, 1899, the following officers were elected for the year 1900: president, Roland Thaxter; vice-president, Walter Deane; corresponding secretary, Edward L. Rand; recording secretary and treasurer, Emile F. Williams; phaenogamic curator, Merritt L. Fernald; cryptogamic curator, Hollis Webster; councillors, Frank S. Collins, Nathaniel T. Kidder and Benjamin L. Robinson.

Vol. 1, No. 12, including pages 215 to 243, plate 11, and title-page of the volume, was issued December 4, 1899.

From photographs.

WITCHES' BROOMS FORMED ON THE WHITE SPRUCE BY ARCEUTHOBIUM PUSILLUM.

C. E. Faxon del.

ARCEUTHOBIUM PUSILLUM ON THE BLACK SPRUCE.

From a photograph.

WITCHES' BROOM FORMED ON THE LARCH BY ARCEUTHOBIUM PUSILLUM.

Rhodora

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THE BLACKBERRIES OF NEW ENGLAND.

EZRA BRAINERD.

It is now somewhat over a year since Professor L. H. Bailey published his admirable revision of the Blackberries of Eastern North America. We have had time to consider, in a tentative way, to what extent his disposition of the species clears up the difficulties of our New England forms, and to get some preliminary notion of the number and range of our species.

The genus is especially interesting because of its economic value. Thousands of acres of blackberries are now under cultivation, and the improved varieties are a welcome addition to our table delicacies. At the same time no group of flowering plants has furnished so many stumbling-blocks to the botanists. These two facts have a logical connection. For, as Darwin long ago pointed out, those plants that reward most the efforts of the horticulturist to improve them, are the plants that vary most in the wild state, and consequently most perplex the systematic botanist. Indeed, in the history of the blackberry problem the horticulturist has in several instances recognized new species and varieties, and named them in advance of the botanist. "Bartel," "Snyder" and "Lucretia" are older names than *Rubus invisus, sativus* or *roribaccus*.

In the Old World the genus is noted for its multiplicity of forms. The English bramble, *Rubus fruticosus*, L., is the analogue of our blackberry; in Hooker's Flora of the British Islands it is divided into twenty-one sub-species, and under these twenty more forms are described as varieties. In Garcke's Flora of Germany we find thirty-eight species and twenty varieties. Our American blackberry is so

excessively variable, that in order to be completely understood, it may in time need to be presented under as many mental types. But we most sincerely hope that only experts—after years of study—will attempt it. Meanwhile we shall have accomplished much if we can seize hold of the dominant types. These are distinct enough and cover the forms ordinarily met with; and the many intergrading and aberrant forms, that occur here and there, are best understood when viewed in connection with certain well-defined landmarks.

Two general characters of the group should be noticed. First, that though the root is perennial, the growth above ground is biennial. During the first year the cane does not normally bear flowers—only leaves; its function is vegetative. The leaves at this time are best developed and most characteristic. They are usually 5-foliate; those of the second season 3-foliate. It is important that collectors should get specimens of the first season's growth when collecting flowering or fruiting specimens. During the second season the function of the cane is principally reproductive. It flowers and fruits, and in some species propagates by rooting at the recurved tip, and then dies. Now and then, however, a plant seems to have a confused notion of time; the two vital impulses seem to work simultaneously, giving rise to strange and abnormal forms. Sometimes the cane flowers at the close of the first season, the flowers with long pedicels appearing singly in the axils of the upper leaves, and the fruit ripening much later than usual. Other aberrant forms result from excessive leaf-vigor during the second season. This is more likely to occur when the plant grows in the shade; the racemes then have fewer flowers, and the pedicels are more or less subtended by leaves. In a remarkable freak of *Rubus nigrobaccus*, collected by Mr. Fernald at Alstead, N. H., August 7, 1899, this frondose impulse has transformed the sepals into lanceolate, laciniate leaves one or two inches in length. At the same time the pedicels and the axis of the raceme are lengthened, and the fruit reduced to a few drupelets.

The second general character to be noticed is the peculiar mixed inflorescence. The flower cluster is normally a raceme, but cymose to this extent, that it has a terminal flower that opens first of all. This terminal flower is sometimes aborted; but it generally produces a berry, that seems, in the upright species, to have a much shorter pedicel than the other berries of the cluster. Professor Bailey (Evolution of our Native Fruits, p. 332) seems to imply that this mixed inflores-

cence is confined to the dewberry, and may serve to distinguish it from the bush blackberry; but a little observation will show that blackberries and dewberries are alike in this respect. It may be further noted that occasionally the raceme is slightly compound, the lower pedicels developing into two- to several-flowered peduncles. This is common in *R. hispidus* and in *R. nigrobaccus.*

Of the principal forms of blackberries recognized by Professor Bailey in his revision, I find that thirteen occur in New England. Their distinctive marks will be given in the synopsis at the close of this article. But certain preliminary observations regarding range, habitat or synonomy may be of interest to students of the genus.

RUBUS NIGROBACCUS is the name happily coined by Professor Bailey for the common species of "highbush blackberry." The name by which it has been heretofore known, *R. villosus,* was originally given by the English botanist, Aiton, to our common dewberry, and is rightfully restored to that species. *R. nigrobaccus* is the plant that springs up so abundantly in wayside thickets and in clearings, before the stumps are sufficiently rotted for ploughing. It is, however, uncommon at elevations of over a thousand feet, at least in the mountains of Vermont. During a three days' ramble last August over the town of Woodbury (alt. c. 1500 ft.), not a single plant was noticed, though several other species of Rubus were abundant. Occasionally plants occur that produce white or amber-colored berries; this Professor Bailey has marked off as var. *albinus.* But it appears to be rather an abnormal state than a proper botanical variety. At least five stations are reported for Vermont. Two New Hampshire stations are reported in RHODORA I, p. 205.

RUBUS ALLEGHENIENSIS, Porter, was first described from the mountains of Pennsylvania, and is reported to be abundant in the Adirondacks. It is said in The Illustrated Flora to be "the characteristic High Blackberry of the mountains of the Eastern and Middle States." A specimen with immature fruit, collected by Dr. B. L. Robinson, at Jaffrey, N. H., July 7, 1897, has all the characters of the species that would appear at that stage of growth. I have distinct recollections of finding in past years certain bushes that bore long, slim, fine-grained, dryish fruit, markedly different from the oval, luscious fruit on neighboring plants. It is hoped that collectors in New England will be on the outlook for this species another season. Professor Bailey remarks that "in its typical form it is very well marked, and seems to be worthy

specific rank; but in intermediate stations it seems to grade into the species," i. e., *R. nigrobaccus*.

Rubus argutus, Link, is the oldest name of the plant described under *Rubus villosus*, var. *frondosus* in the Gray Manual and in Britton & Brown's Ill. Flora. As ordinarily found in western Vermont it is quite distinct from *R. nigrobaccus*, and though not so common it is of wider range, ascending to higher altitudes. But along the seaboard it passes by imperceptible degrees into that species.

Rubus argutus, var. Randii, Bailey. This distinct blackberry, detected first by Mr. Edward L. Rand in 1894, at Mt. Desert, Maine, proves to be common in New England. In habit it differs markedly from *R. argutus*. It affects shady thickets rather than the open; the canes are short, recurving, with few weak prickles or none; not stiff, strict and thorny as in the species. Last summer, in the mountain town of Woodbury, Vt., the fruit was abundant enough to be served at the hotel tables, and though small surely disproved the charge of being "dry and seedy." At lower altitudes the inflorescence, leaf-stalks and leaves beneath are softly pubescent; the glabrous form of the mountain seems nearer to *R. canadensis* than to *R. argutus*.

Rubus canadensis, L. This plant was the first among American species to obtain scientific recognition. Linnæus, in his Species Plantarum of 1753 so christened a specimen collected by the Swedish traveller, Kalm, who several years before had made an extended visit to the French settlements of Lake Champlain and the St. Lawrence. The name, however, was misapplied by American botanists, and the species remained unrecognized until rediscovered in 1890, in the mountains of western Virginia, at an altitude of 3500 feet, and named *R. Millspaughii*, by Dr. Britton, in honor of the collector. It turns out to be a common species in the highlands of New England. In its best estate the canes are ten feet long and an inch in diameter at the base. With its thornless stems, large flowers and juicy fruit, it is by far the most stately and amiable of all our blackberries.

Rubus sativus. This is *Rubus nigrobaccus*, var. *sativus*, Bailey, which we are confident should be regarded as a distinct species. As we find it in western Vermont it is farther removed from *R. nigrobaccus* than any of the four forms last mentioned. In pubescence it is quite like *R. argutus*; it has almost the smoothness of *R. canadensis*, and is even more dwarf than var. *Randii*. It is peculiar in its reduced, leafy flower-cluster, and very broad leaflets. The name chosen by

Professor Bailey is most appropriate, as the species is the parent of some of our best garden varieties.

Rubus nigrobaccus × villosus, Bailey. This hybrid Professor Bailey finds common in Central New York, and he has so named specimens from a large colony covering a quarter of an acre in Weybridge, Vermont. It has been found in four other towns in western Vermont. We find it difficult to accept this disposition of our Vermont plant, which has more slender bristles, and wider, more glabrous and more sharply toothed leaflets than are found in either of the alleged parents. The botanical status of this plant requires further investigation.

Rubus cuneifolius, Pursh, with leaves whitish pubescent beneath, is a southern species that barely enters New England in southern Connecticut. Specimens seen were from Stratford, East Haven, Killingworth and Milford.

Rubus setosus, Bigelow (Florula Bostoniensis, 1824). This plant seems to be not rare in the vicinity of Boston, but it has strangely failed of recognition in any edition of the Gray Manual. The stems are usually erect; but trailing forms are not infrequent even in the same colony. It varies also greatly in the width of the leaflet and in the abundance of its bristles. Wide-leaved, prostrate forms are easily mistaken for *Rubus hispidus*. The species appears to be widely distributed in New England.

There remain to be noticed, briefly, our four species of *trailing* blackberries, or dewberries.

Rubus villosus, Ait. As noted above, this name must hereafter be applied to what for over a century has been incorrectly passing as *R. canadensis*. It is abundant in the lowlands of New England, in sterile soil; but rare in the mountains and in Maine, north of the coast. The species, though still a variable one, has been much simplified by the segregation of the two following.

Rubus invisus, Bailey, is a plant every way larger than *R. villosus*. Specimens have been seen from Connecticut, Massachusetts and Maine. The Maine plant, collected by Mr. Fernald in Foxcroft, August 31, 1897, is more robust than the types from Ithaca, N. Y., which, through the kindness of Professor Bailey, I have been permitted to examine, has more oval and more sharply toothed leaflets, and may be deserving of varietal distinction.

Rubus Enslenii, Tratt., has been identified by Professor Bailey with the *R. villosus* var. *humifusus* of Torrey. With its slender stem

and single flowers on long pedicels it is easily recognized. But it should be noted that in this, as in the two preceding species, the stem is sometimes erect,—recurving if prolonged. The type specimens of Trattinnick were evidently erect; those of Torrey, prostrate. We find eight specimens of this species in the herbaria of the New England Botanical Club, and of Judge J. R. Churchill, — all collected in eastern Massachusetts.

Rubus hispidus, L., when no longer confused with *R. setosus* is a well-marked species. It seems to be widely distributed in New England. Some authorities describe the fruit as red or purple; but I find it when ripe to be as black as that of its fellow species. The old verbal paradox still holds good, that blackberries are *green* when they are red.

The following synopsis of the blackberries of New England has been carefully prepared, in the hope that it may prove of service in determining the species: —

I. Blackberry proper. Canes erect or ascending. (Sometimes prostrate in *R. setosus.*)
- *A.* Plants tall, usually over three feet.
  - 1. Armed with stout prickles.
    - *a.* Canes long and curving; new growth glandular pubescent; racemes long, leafless, with divergent pedicels; fruit oblong. *R. nigrobaccus.*
    - *b.* Fruit long, narrow, tapering; drupelets numerous and small; branches reddish; gland-tipped hairs abundant. *R. allegheniensis.*
    - *c.* Canes strict, shorter; new growth finely pubescent, slightly if at all glandular; racemes shorter, often with leafy bracts at base of lower pedicels; fruit roundish; petals broad. *R. argutus.*
  - 2. Prickles wanting, or if present few and small; leaflets glabrous, on new canes long acuminate. *R. canadensis.*
- *B.* Plants low, usually less than three feet.
  - 1. Prickles stout and numerous; leaves white beneath. *R. cuneifolius.*
  - 2. Prickles slender; leaves green beneath.
    - *a.* Prickles short, few or wanting.
      - (1) Racemes very short, few-flowered, leafy; pedicels and leaves beneath softly pubescent; leaflets broad, terminal one on new canes often orbicular, slightly cordate at base, abruptly pointed. *R. sativus.*
      - (2) Racemes loosely few-flowered, leafy; lower pedicels remote, long and ascending; leaflets glabrous with irregular teeth. *R. nigrobaccus × villosus.*
      - (3) Racemes short; usually with a rather large simple leaf at base; leaflets glabrous or pubescent, with sharp and unequal teeth, on new canes ovate, acuminate. *R. argutus* var. *Randii.*
    - *b.* Usually beset with slightly retrorse bristles, yellowish when young; leaflets glabrous, acute, from ovate to narrowly obovate. *R. setosus.*

II. DEWBERRY. Stems trailing, but in the first three species occasionally erect, recurving to the ground if elongate.

A. Leaflets oval or ovate, acute or pointed, dull, usually somewhat pubescent beneath; pedicels long and ascending; prickles stiff.

1. Branches few- to several-flowered.

a. Leaflets large, thin, coarsely and simply toothed, terminal one usually rounded at the base; flowers and fruit large; stems stout with tall branches. *R. invisus.*

b. Leaflets firm, sharply and somewhat doubly toothed; plant every way smaller. *R. villosus.*

2. Branches 1-flowered (sometimes 2-flowered); leaflets thin; stems slender, with few minute prickles. *R. Enslenii.*

B. Leaflets obovate, blunt, glabrous, shining; pedicels in flower short, divergent; flowers and fruit small; stems slender, with small, weak bristles. *R. hispidus.*

(Trailing forms of *R. setosus* may be looked for here and may be separated by the acute, dull leaves and larger flowers.)

THE RELATION OF CERTAIN PLANTS TO ATMOSPHERIC MOISTURE.

ROBERT G. LEAVITT.

ORCHIDS. In making some tests of absorption by orchids, in the interests of the scientific side of practical gardening, I was surprised to find little or none of the power of condensing water-vapor which is popularly ascribed to the aërial roots of epiphytes. Not the public alone, but gardeners universally, and botanists pretty generally, regard air-plants as capable of "feeding upon the air." The highest authority, too, may be cited in support of such an opinion. Thus Sachs[1] says, "The walls [of the velamen] are capable of imbibing, and are able to absorb, not only rain and dew but even the vapor of the atmosphere." Kerner,[2] the popularity of whose Natural History of Plants gives his opinions wide vogue, is explicit in the assertion that "the power of condensing aqueous vapor, and other gases as well, is of the greatest importance to these plants." He repeats and amplifies this at considerable length.

The doctrine of vapor-absorption goes back to the experimental work of Unger[3] (1854) and Leitgeb[4] (1864). The contrary view was expressed, after experimentation, by Duchartre[5] (1856). He says that "the leaves do not breathe in the vapor of water diffused in

1 Phys. of Plants, Eng. Tr., 1887, p. 25. 2 Natural History of Plants, Vol. I., p. 222.
3 Physiologie der Gewächse, 1855, p. 307. 4 Denkschr. d. Wiener Akad., 1864, p. 215.
5 Quoted, Bull. de la Soc. Bot. de Fr., 1895, s. 3, t. II, p. 99.

the air, whatever the proportion; and aërial roots are equally devoid of any power of absorbing vapor." Goebel,[1] from extended observation of epiphytes in their native habitats, arrives at the conclusion that absorption of vapor is at any rate not the chief function of aërial roots, and approves Duchartre's opinion. Schimper[2] is equally reserved.

Up to the present moment too little experimental evidence is available to enable one to form a final opinion. It is easy to see possible defects in all the methods employed. For example, cut-off roots, it may be held, are under essentially unnatural conditions. On the other hand if one works with entire plants, transpiration from the shoot and assimilation enter as factors in the loss or gain of weight. Again, the vapor-conditions have been under no sort of control (with one exception to be mentioned). Thus when Kerner writes as follows, one is disposed to attribute the increase of weight to the formation of dew in a closed receptacle, the temperature of which was not guarded against change. He says: "If the aërial roots of *Oncidium sphacelatum* are transferred from a chamber full of dry air to one full of moist air, they take up in twenty-four hours, somewhat more than eight per cent of their weight of water." According to Pfeffer,[3] Sachs probably introduced the same error into his determination of imbibition by dried wood. As to aërial roots Pfeffer is silent, as far as I have read his latest text; but he notes the very indifferent capacity of vegetable tissues in general for acquiring water in the gas-form.

When my first tests were made, with cut roots partially dried in the laboratory and then laid in a moist orchid house, I looked for an addition to the weight. The humidity there was usually from .80 to .85. I found at the end of twenty-four hours, that the roots were drier and lighter than at the beginning.

A large box was then partly filled with sphagnum. This was soaked with water, a glass was placed on the sphagnum, and on this were laid the roots. A wet and dry bulb hygrometer, read through glass let into the end of the box, gave the humidities. Finally the whole was closed in by a sheet of glass, so that the roots had the advantage of light. The ventilation was so adjusted that at no time did the humidity rise above .95, and varied from this down to a bit below .90.

1 Pflanzenbiologische Schilderungen I, p. 188. 2 Pflanzen-Geographie, 1898, p. 343. 3 Pflanzenphysiolagie, last edition, p. 143.

Precipitation of dew was thus wholly precluded, and yet the roots were exposed to the action of a greater proportion of vapor than usually obtains in nature. If at the above humidity the roots were found to be unable to win a supply of water, then it would seem that their condensing power must be unimportant or wanting.

As to the evidence from cut roots, this may be said in favor of its admittance, viz., that the roots of epiphytes, as Schimper points out, play a considerable rôle in assimilation. The growing tips are intensely green, and the parenchyma under the velamen is provided with chlorophyll. In one West Indian *Angraecum*, indeed, the roots have usurped the function of leaves, so that except at the flowering season the plant body consists almost wholly of roots. From the physiological standpoint, therefore, cut roots may be considered fairly perfect wholes.

It must be granted, however, that the point is open to objection; and Dr. Goodale has proposed a method of using whole plants which seems the most satisfactory mode yet devised. Thus far the results obtained by this method accord with those obtained from cut roots.

The genera represented (by twenty-four species) were *Dendrobium*, *Epidendrum*, *Peristeria*, *Scuticaria*, *Laelia*, *Cattleya*, *Burlingtonia*, *Brassavola*, *Cymbidium*, *Brassia*, *Selenipedium*, *Vanda*, *Cypripedium*, *Oncidium*, *Angraecum*, *Masdevallia*, *Odontoglossum*, and *Maxillaria*. From many of the species several different roots were used.

The trials lasted in each case from two to four days, and in a few cases much longer. Some roots were taken from unwatered plants, and after weighing were put at once into the damp-box. Others were left in the laboratory until very dry to the touch, but put to the test while the tips were still green and turgid. The cut ends were usually waxed or otherwise sealed.

In all cases a diminution of weight was ascertained. The shriveling was often astonishing. Control roots from some of the same plants, having access to liquid water, kept vigorous and active in the same box. The manner of the drying up was significant. It began at the cut end and traveled toward the still turgid terminal portion. The latter seemed to be drawing water from the older parts. At any rate the velamen was entirely unable to supply, out of the abundant vapor at hand, the needs of the suffering cells beneath.

Since my work with cut roots was completed, the Centralblatt has

published a paper by Nabokich[1] in which he reaches the same conclusion as Duchartre. Nabokich used cut roots of about a dozen different species, and found in all but one (doubtful) case a slight loss of weight in the saturated atmosphere of a thermostat.

(To be continued.)

UNUSUAL VARIATIONS OF TWO COMMON AGARICS.

H. Webster.

To say that *Armillaria mellea* is variable in its appearance is to fall far short of adequately expressing the truth in regard to this common agaric. Like *Laccaria laccata*, it puts on such an extremely unfamiliar look at times that one almost loses faith in the fixity of specific limits. Although typical forms are rarely wanting in its fruiting season, others are always abundant which, in color, surface, size, proportions, and especially in the character of the veil, are more or less striking in the tendency which they show to efface more or less completely some normally essential characteristic. Perhaps the taste is as constant as anything about the plant, and it may often be relied on to resolve a doubt. On the veil and ring no dependence can be placed whatever. Typically strong and fibrous, and even forming a wide-spreading, persistent collar, the veil is sometimes almost or entirely wanting at maturity. In a form found in Cambridge in October, 1898, and shown to the writer, the veil was glutinous and transparent, except immediately about the stem. The fibrous nature of the outer portions could not be detected by the naked eye any more than in the veils of *Cortinarius collinitus* or of *Hygrophorus fuligineus*. The glutinous character of the veil extended to the surface of the pileus which was extremely viscid. The plants were collected after a rain.

From several stations near Boston came reports last autumn of a form of the common *Lepiota naucina*, to which the name of "Smooth Agaric" has been given, in which the pileus was covered with brown scales. In two cases specimens were submitted which showed this character very strikingly, the surface being almost as rough and on the whole darker than is the case in *Lepiota cristata* and similiar species. These forms were growing with others in every way typical. Such an

[1] Bot. Centrbl. LXXX., 1899, p. 333.

extreme variation, however, is not allowed for in the descriptions and, were a group of such forms found in an isolated station, they might easily prove puzzling. Among the specimens submitted were two buttons nearly white at first, which, after lying a few hours in the dry air of a room, turned browner, a part of the surface cracking into scales.

Such instances of variation occurring in common fungi show the necessity, so strongly emphasized by Fries, of keeping close and constant watch of plants in the field from year to year, and they further suggest the possibility that in the case of species of rare occurrence and solitary habit, such as, for instance, *Amanita strobiliformis* and its allies, it may be that forms have been kept separate which should really be closely associated.

LUXURIANT DEVELOPMENT OF SPIROGYRA CRASSA IN REFILLED PONDS.

G. E. Stone.

Spirogyra crassa, Kuetz., one of the largest species of the genus, has been under my observation, more or less, in an incidental manner, for some twelve years. A peculiar trait which I have repeatedly observed, and to which I wish to call attention, is its remarkable abundance under certain conditions. In every instance the unusual abundance of this species was connected with the drawing off the water from artificial ponds, the drying up of the bed, and the subsequent refilling. I know of four instances where ponds have become dry, and in every case there has been a luxuriant growth the following season of this species, not common before in these ponds.

In two cases the locality was the pond in the Public Garden in Boston, the first occurring in 1886, the second a few years later; the third case was that of a small pond at Spencer, Mass., in 1889; the fourth, a pond in the Agricultural College grounds at Amherst, Mass., in 1893. In all these instances the plant was so common that it almost completely covered the surface of the water, at Amherst it became a nuisance, and cartloads of the floating filaments were gathered and carried away. Similar results, to a less noticeable extent, have been observed under similar conditions in ponds in Worcester.

The Spencer and Amherst ponds are contaminated with sewage

and the Public Garden pond has a very muddy bottom. The luxuriant growth may be partly due to this. Yet the fact that the species appeared so regularly and abundantly after the reservoirs had been emptied would seem to indicate that the drying out of the soil constituents of the pond acted as a stimulus to the germination of the spores, which were dormant in the soil. In all of the localities named, this alga was more or less abundant during the second year after the ponds were emptied, although in other years, as already remarked, it was rare or absent.

The ponds being unconnected, the plant could not have originated in one and spread to the others; and the difference in dates excludes general climatic conditions from producing the results.

S. crassa is here taken in the sense in which it is used by Wolle (Fresh Water Algae of the United States). The form found in Massachusetts appears to be fairly distinct, but there may be some doubt in referring it to any particular European form.

COREOPSIS INVOLUCRATA ON THE ATLANTIC COAST. — Permit me to mention in the columns of RHODORA a plant which seems a good way from home. Several years since, Miss Sarah Fell, an enthusiastic botanist of this city, discovered in the reclaimed tide-water marshes at the junction of Christiana Creek with Delaware River, the southwestern *Coreopsis involucrata* of Nuttall. It was again found in great profusion this year by Mr. Commons, and later by myself, growing along a "marsh road." It is a fine species, not very unlike *C. trichosperma*, Michx., which is also common here. — WM. M. CANBY, Wilmington, Delaware.

[The closely related *C. aristosa*, Michx., has been twice collected on wool waste in New England: by *C. W. Swan* at Dracut, Mass., in 1894, and by *J. C. Parlin* and *M. L. Fernald* at North Berwick, Me., in 1897. *C. involucrata* may be expected in such places. — ED.]

THE DISTRIBUTION OF CERTAIN TREES AND SHRUBS IN WESTERN CONNECTICUT.

CHARLES K. AVERILL.

THE following notes on the distribution of certain trees and shrubs in the Housatonic River region of western Connecticut may be of

interest. They should be taken, however, as a preliminary reconnaissance, and not as an attempt to fix definitely the bounds of the species.

From an elevation of about 690 feet at Canaan, the river descends to the sea at Stratford, a distance of about eighty miles. It is throughout a beautiful stream, and the wooded condition of the hills on either side gives a wild aspect to its scenery. But little large timber is seen, as may be expected in a region abounding in lime and containing some iron ore.

Where the Still River enters the Housatonic, *Acer dasycarpum* is seen on the alluvial deposits and at other places in the town of New Milford, particularly in the vicinity of the village of the same name. At Kent it is known as the "river maple." It is common all the way up to Sheffield, Mass., wherever there is any considerable deposit of alluvial soil and is confined to this soil.

The Cottonwood, *Populus monilifera*, is found along the river from tide water to Pittsfield, Mass. It occurs sometimes at a distance of a mile or two therefrom, along highways and open places, but I have not seen it in the woods.

In Rhodora, i. 39, I noted *Populus balsamifera* growing along the river in New Milford. It appears to have been introduced. Recently I went over this ground with Mr. E. H. Austin, to whom I am indebted for much valuable information about the plants of that region. The trees are extended along the river for a distance of five or six miles, but have evidently been derived from a tree set out about sixty or more years ago in front of a house on the east bank about a mile south of Kent village. The original tree has been cut down, but an old lady was found who could remember it. We could get no information as to where it came from. The rapid spread of the tree is interesting, and would be possible only in a tree of rapid growth. I counted the rings in a stump cut off near the ground and about thirty-two inches in diameter. There were thirty-two, showing an increase in diameter of an inch per year.

Two trees, the canoe birch and the larch, show the effect of altitude and latitude in their distribution. Going northward from the coast, the canoe birch, *Betula papyrifera*, is first seen in the northern part of New Milford, where it is common, and from thence north it is a conspicuous tree on many of the hillsides. In the Berzelius List of Plants within thirty miles of New Haven it is given as rare, with three localities specified, viz., Maltby Park, near New Haven, Wallingford, and Wading River, Long Island.

The Larch, *Larix Americana*, is found in the swamps in Brookfield and New Milford, and thence northward. The Berzelius list records it from Danbury, the most southerly point I am aware of.

In the Berzelius list the Black Spruce, *Picea nigra*, Link, was given as follows: "Formerly at Wading River, L. I. 'Twenty years ago there was quite a clump of this spruce near Waterbury, but the trees were all killed by fire.' H. J. Bassett."

Just south of Botsford station on the Berkshire Division railroad, partly in the town of Newtown and partly in Monroe, the railroad passes through a large swamp, at an elevation of about four hundred feet. In winter the spruce trees can be seen from the train. I have never explored the swamp thoroughly, but once I climbed a hill to the west where I could overlook it. Its area appears to be about a square mile, and the spruces are scattered in various parts of it. A few specimens secured show that it is *P. nigra*, Link. This is perhaps the most southerly station in New England.

On the north shore of Spectacle Ponds, in the town of Kent, at an elevation of 1,200 feet, there are a few trees of this species growing in a sphagnum swamp. They were much damaged by an ice-storm two winters ago.

Among the Oaks I have seen *Quercus stellata*, Wang, on the seashore at Milford sparingly, but not away from the coast. *Q. macrocarpa* I have not found in the State of Connecticut; but a few miles over the line in Massachusetts it occurs near a highway a little west of Van Deusenville station; also a few saplings near Stockbridge. It is recorded from Connecticut in Bishop's List of Connecticut Plants. *Q. Muhlenbergia* occurs on the limestone formation in the neighborhood of Kent. *Q. palustris*, Du Roi, is an abundant tree in the low grounds in the vicinity of the coast, but is not common in the northern part of the State, although I have seen it at New Milford and Canaan.

Q. ilicifolia, Wang, occurs abundantly on the higher exposed places of barren hills all through the region. Near the summit of Long Mountain, in the town of New Milford, in a small swamp, are some very large specimens, one of which surpasses any I have heard of. It comes from the ground with a single trunk measuring forty-four inches in circumference. At about fourteen inches from the ground it divides into two branches, the larger of which measures twenty-nine inches round. The branches soon become horizontal and spread widely.

The Greenwich station, for *Liquidambar Styraciflua*, described by Mr. Harger in the July RHODORA, is not the most easterly and northerly station. As given in Bishop's additional list of Connecticut plants, it occurs from Darien to Five Mile River, where reported by Miss A. E. Carpenter. I visited the place last September, and made a hurried examination. The trees were growing plentifully in a piece of wet woods bounded north by the railroad track, and south by the highway on which the trolley runs. Easterly they extend nearly to the Five Mile River. I did not go to their western boundary, but they appeared to extend westerly for at least half a mile. This station is about eight to ten miles easterly from the Greenwich one. Some of the trees were of good size. I measured one six and a half feet round at five feet from the ground. There were many others that looked as large. While this tree has been cultivated somewhat in this region, I should judge this to be a natural station.

Fraxinus sambucifolia, the black ash, which is not given in the Berzelius list, and in Bishop's list is given as rare, I have seen at a number of places from Stratford on the coast, to Stockbridge, Mass., always in wet places, but not usually near the river.

I have mentioned the canoe birch and tamarack as showing the effect of altitude and latitude in their distribution. This is better shown in a number of shrubs which are common in the northern part; rare or lacking in the southern.

Acer spicatum and *Acer Pennsylvanicum* are tolerably common in New Milford, Kent, and in Cornwall, but not south. The Berzelius list gives them as occurring at stations twenty to thirty miles north of New Haven, except *spicatum*, which has a station as far south as North Branford.

Viburnum cassinoides I have seen in a few elevated places in New Milford and Kent; *V. Opulus* in several places from Kent north, also in Brookfield; *V. lantanoides* I have from one station in Kent. None of these have I seen in the southern portion, and they are not in the Berzelius list.

Sambucus racemosa occurs among the higher hills of New Milford; and while not seen in the southern part of the Housatonic region, I have found it at East Rock, New Haven. *Cornus Canadensis* is not rare in swamps about New Milford; it grows also in the swamp with the spruce trees at Botsford. It was formerly found near New Haven.

Potentilla fruticosa is abundant over the northern half of the

region; apparently lacking south of New Milford. *Chiogenes hispidula* and *Kalmia glauca* grow at Spectacle Ponds, Kent; *Andromeda polifolia* at Spectacle Ponds and Hatch Pond; *Cassandra calyculata* as far south as Huntington; and in Berzelius list, at Riverhead, L. I. This is more common and more southerly than the two preceding.

Nemopanthus fasicularis is common around New Milford and Kent in swamps.

Many examples of herbaceous plants could be given corroborating the effect of altitude and latitude, which, however, it will be better to defer till another time.

Bridgeport, Conn.

IS ARTEMISIA STELLERIANA A NATIVE OF NEW ENGLAND?

M. L. Fernald.

One of the most conspicuous plants of sand-dunes and the drier portions of many sea-beaches of New England is *Artemisia Stelleriana*, a species first described from Kamtschatka. Yet, abundant as is the plant about many of our long-visited resorts, Mt. Desert, Old Orchard, Nahant, Nantasket, Truro, Martha's Vineyard, Narraganset Pier, Newport, and New London, as well as Long Reach and Sandy Hook, it was apparently unrecorded in our botanical literature until within the last quarter-century. Probably the first station noted in eastern America was at Nahant, Massachusetts, in 1877. A specimen collected there, or on the adjacent Lynn Beach, by Dr. W. G. Farlow, in 1879, is labelled "growing wild in large tufts," and of this station Mr. John Robinson wrote in 1880, "evidently increasing quite rapidly." A specimen collected by Miss G. H. Learned at New London, Connecticut, in 1892, is marked "well established." These notes of Dr. Farlow, Mr. Robinson, and Miss Learned, then, as well as Dr. Britton's records of the plant in his New Jersey catalogue, indicate their belief that the plant is introduced.

On the other hand, there is a rather general idea that the plant is indigenous on our coast. In the Synoptical Flora and in the last edition of Gray's Manual this is suggested, though with some doubt; in various local floras the plant is treated in the same non-committal way; and in the Illustrated Flora, though its introduction into eastern America

may be inferred, no definite statement to that effect is made, as is done in case of *A. Absinthium*, *A. Abrotanum*, *A. annua*, etc. Thus as treated in standard works the exact status of the species in our flora is not clearly defined.

It is a significant fact that this very conspicuous plant was not seen upon the New England coast until 1877, and that from that date until the present time it has appeared in ever-increasing abundance at points long known and visited by botanists. Furthermore, in 1876, the plant was discovered in dry sand on the coast of Skåne, the southernmost province of Sweden, "the most thoroughly examined province of Sweden from the botanist's point of view;" in 1891 it was found on the sandy coast at North Bull, County Dublin, Ireland; in 1892, on the coast of Zealand, Denmark; and in 1895 on the sands between Penzance and Marazion in Cornwall.

In the Journal of Botany for 1894 and previously in a Swedish journal, *Botaniska Notiser*, Professor Areschoug discussed [1] at length the occurrence of this Kamtschatkan plant in Europe and America, favoring the view that it has long been a member of our flora, until recently overlooked because of its habitat — barren sands which are rarely visited. He further argued that the plant must have spread laterally from northern Asia to Europe and America immediately after the Glacial Period, before the return northward of the flora which now characterizes so much of Europe and America, and that although not yet known to us it will be found in many sandy river-valleys of North America.

Replying to Professor Areschoug's most interesting and ingenious argument, Mr. Nathaniel Colgan showed [2] very conclusively that the extensive colony of the plant found by him in County Dublin had originated from waste fragments thrown upon the sand from a neighboring nursery. The simple explanation given by Mr. Colgan of the origin of the colony in Ireland is essentially applicable to our American stations. If this very conspicuous plant were indigenous upon Old Orchard, Nahant, Martha's Vineyard, and other sandy shores, it is singular that no one observed it before 1877. Mr. Walter Deane informs me that in his youth he was familiar with Old Orchard Beach, and that at that time this *Artemisia* was not seen; in Tracy's list (1858) of the plants of Lynn it is not mentioned, nor does the late Dr. Morong note it in

[1] Botaniska Notiser, 1880, 137, and 1893, 111; Journ. Bot. xxxii. 70.

[2] Journ. Bot. l. c. 104.

his paper[1] upon the flora of Martha's Vineyard. However, in the seventies *A. Stelleriana* was popular in America, as well as in Europe, as a bedding plant. For a few years it was used very extensively for its mass of gray foliage, and to-day, in many old-fashioned gardens in Maine, it is still a favorite under the name "Dusty Miller." Professor Areschoug argued that because the plant rarely spreads from gardens to the neighboring districts and because it abounds on sand-dunes and beaches remote from gardens it cannot have escaped from cultivation to its present coastal stations. It cannot be stated with assurance that the plant has reached the New England sea-beaches directly from neighboring gardens; but a statement made by a nurseryman, attempting to account for the colony in County Dublin, and quoted by Mr. Colgan in his article above cited may as well apply to our own as to the Irish station: "It is a plant of the freest possible growth. Any bit of the top or rootstock swept out with refuse would be sure to grow. . . . Tops have often been used for mixing with cut-flowers, and may have assisted in the make-up of breast-bouquets, which, worn by some visitor to the North Bull, may have been thrown away as withered, and have got covered with sand." In view, then, of the very striking habit of the plant, its sudden appearance on sea-beaches and sand-dunes, especially in the neighborhood of summer resorts, soon after its period of popularity as a bedding plant, and its probable absence from our flora prior to that time, there seems no doubt that *Artemisia Stelleriana* was originally introduced along our coast and that we have no reason longer to regard it as a species native to New England.

Gray Herbarium.

Plant Relations,[2] by Prof. J. M. Coulter of the University of Chicago, is a clear and terse statement of the biological relations of plants to each other, to their inorganic environment, and to animals. It thus presents what are doubtless the most fascinating or, as one may say, the most sensational aspects of plant life. The illustrations are numerous and excellent both as to clearness and artistic effect. In fact they are, as in some of our current magazines, so copious and striking as to distract the attention and impair the power of concentrating upon the text.

[1] Field and Forest, iii (1878), 119.

[2] Octavo, vii and 264 pp. copiously illustrated and well indexed. Appleton & Co., 1899.

PRELIMINARY LISTS OF NEW ENGLAND PLANTS,—V. MARINE ALGAE.[1]

FRANK S. COLLINS.

[The sign + indicates that an herbarium specimen has been seen; the sign — that a printed record has been found.]

The State of Vermont, having no coast line, is omitted in this list. Massachusetts, however, is divided into two parts, northern and southern, as the most strongly marked division line for algae on the whole Atlantic coast occurs here. As regards the marine flora, Nahant and Nantucket differ more from each other than the former does from Newfoundland, or the latter from Fortress Monroe. The division line is usually given as Cape Cod, but as the flora of the inside of the lower cape is the same as that of Vineyard Sound, the latitude of Provincetown has been taken as the boundary.

Among the Schizophyceae will be found some species usually classed as fresh water algae; but as they were found growing among undoubted marine species, it seemed best to include them.

SCHIZOPHYCEAE.

	Me.	N. H.	N. Mass.	S. Mass.	R. I.	Conn.
Amphithrix janthina (Mont.) Born. & Flah.			+			
" " var. torulosa (Grunow) Born. & Flah.			+			
" violacea (Kuetz.) Born. & Flah.	+				+	+
Anabaena torulosa (Carm.) Lagerh.	+	+	+	+	+	+
" variabilis Kuetz.					+	+
Brachytrichia Quoyii (Ag.) Born. & Flah.				+		
Calothrix aeruginea (Kuetz.) Thuret.	+		+			+
" confervicola (Dillw.) Ag.	+	+	+	+	+	+
" crustacea Thuret.	+	+	+	+	+	+
" fasciculata Ag.	+		+		+	
" " forma incrustans Collins			+			
" fusco-violacea Crouan.				+		
" parasitica (Chauv.) Thuret.	+	+	+	+	+	+
" pulvinata (Mert.) Ag.	+		+	+	—	+
" scopulorum (Web. & Mohr) Ag.	+	+	+	+	+	+
" vivipara Harv.			+		+	
Chroococcus turgidus Naeg.	+		+	+	+	+
Cryptoglaena Americana Davis.			+			
Dermocarpa prasina (Reinsch) Born. & Thuret.	+		+		+	+
" violacea Crouan.					+	
Entophysalis granulosa Kuetz.	+			+		+
" Magnoliae Farlow.	+		+			
Gloeocapsa crepidinum Thuret.	+		+	+	+	+

[1] Printed in RHODORA as supplementary material.

	Me.	N. H.	N. Mass.	S. Mass.	R. I.	Conn.
Hydrocoleum glutinosum (Ag.) Gomont. . .			+	+		+
" lyngbyaceum Kuetz.			+	+		
" " var. rupestre Kuetz.	+					
" majus Holden.						+
Hyella caespitosa Born. & Flah.	+		+	+	+	+
Isactis plana (Harv.) Thuret.				+		+
Lyngbya aestuarii (Mert.) Liebm.	+	+	+	+	+	+
" confervoides Ag.				+	—	+
" gracilis (Menegh.) Rab.	+					
" Lagerheimii (Moebius) Gomont. . .						+
" lutea (Ag.) Gomont.	+		+	+	+	+
" majuscula (Dillw.) Harv.		+	+	+	+	+
" semiplena (Ag.) J. Ag.	+	+			+	
" subtilis Holden mss.	+					+
Mastigocoleus testarum Lagerh.	+		+	+	+	+
Microchaete grisea Thuret.	+			+		
Microcoleus chthonoplastes (Fl. Dan.) Thuret.	+	+	+	+	+	+
Nodularia Harveyana (Thwaites) Thuret. . .	+	+	+			+
" spumigena Mert. var. litorea (Kuetz.) Born. & Thuret. . . .	+	+	+			
" " var. major (Kuetz.) Born. & Flah.						+
Oscillatoria amphibia Ag.			+			
" Corallinae (Kuetz.) Gomont. . .						+
" laetevirens Crouan.	+				+	+
" limosa Ag.	+				+	+
" margaritifera Kuetz.			+			
" nigro-viridis Thwaites.	+		+			
" princeps Vauch.			+		+	+
" tenuis Ag.					+	
Ostreobium Quekettii Born. & Flah.						+
Phormidium ambiguum Gomont.			+			
" autumnale (Ag.) Gomont. . . .			+		+	
" Corium (Ag.) Gomont.			+			
" favosum (Bory) Gomont. . . .					+	
" fragile (Menegh.) Gomont. . .	+		+			
" persicinum (Reinke) Gomont. .			+			
" Valderianum (Delponte) Gomont.					+	+
Plectonema calothrichoides Gomont. . . .			+			
" Golenkinianum Gomont. . . .	+					
" terebrans Born. & Flah. . . .					+	+
Pleurocapsa fuliginosa Hauck.			+		+	+
Polycystis elabens Kuetz.	+	+	+	+		+

	Me.	N. H.	N. Mass.	S. Mass.	R. I.	Conn.
Polycystis pallida (Kuetz.) Farlow.	+		+	+	+	
Rivularia atra Roth.	+	+	+	+	+	+
" Biasolettiana Menegh.		+	+	+	+	
" Bornetiana Setchell.					+	+
" nitida Ag.	+		+	+		+
Spirulina Meneghiniana Zan.			+			
" Nordstedtii Gomont.	+					
" subsalsa Oersted.	+	+	+	+		+
" versicolor Cohn.	+					
Symploca hydnoides Kuetz.				+	+	
Xenococcus Schousboei Thuret.	+		+			+
CHLOROPHYCEAE.						
Acroblaste Reinschii Wille.	+		+	—		
Bolbocoleon piliferum Prings.	+		+	+	+	
Bryopsis plumosa (Huds.) Ag.	+	+	+	+	+	+
Chaetomorpha aerea (Dillw.) Kuetz.			+	+	+	+
" Linum (Fl. Dan.) Kuetz.	+	+	+	+	+	+
" Melagonium (Web. & Mohr) Kuetz. forma typica Kjellm.	+		+			+
" Melagonium forma rupincola Aresch.	+	+	+			+
Chlorochytrium Schmitzii Rosenvinge.	+					
Cladophora albida (Huds.) Kuetz.				+	+	
" " var. refracta Thuret.	+		+	+	+	+
" arcta (Dillw.) Kuetz.	+	+	+	+	+	+
" " var. centralis Farlow.	+					
" expansa (Mert.) Kuetz.	+	+	+	+		+
" flexuosa (Griff.) Harv.	+	+	+	+	+	+
" fracta (Fl. Dan.) Kuetz.			+	+	—	
" glaucescens (Griff.) Harv.	+	+	+	+	+	
" gracilis (Griff.) Kuetz.	+	+	+	+	+	+
" " var. expansa Farlow.			+			
" " " tenuis Farlow.			+			
" hirta Kuetz.			+	+	+	
" Hutchinsiae Kuetz.			+			
" " var. diffusa (Harv.) Farlow.	•		+		+	
" laetevirens Kuetz.	+	+	+			
" lanosa (Roth) Kuetz.	+		+	+	+	+
" " var. uncialis (Harv.) Thuret.		+	+		+	+
" Magdalenae Harv.					+	+
" refracta Aresch.	+	+	+	+	+	+

	Me.	N. H.	N. Mass.	S. Mass.	R. I.	Conn.
Cladophora Rudolphiana (Ag.) Harv.	+			+	+	+
" rupestris (L.) Kuetz.	+	+	+		–	+
Codiolum gregarium A. Br.	+		+	+		
" longipes Foslie.	+					
" Petrocelidis Kuckuck.	+					
Derbesia vaucheriaeformis (Harv.) J. Ag.				+		
Enteromorpha clathrata (Roth) J. Ag.	+	+	+	+		+
" " var. Rothiana (Le Jolis) Farlow.			+			
" compressa (L.) Grev.	+		+	+	–	
" crinita (Roth) J. Ag.	+		+		+	+
" cruciata Collins.	+					
" erecta (Lyng.) J. Ag.	+	+	+	+	+	+
" Hopkirkii McCalla.	+	+	+	+		+
" intestinalis (L.) Link.	+	+	+	+	+	+
" " forma cylindracea J. Ag.			+	+	+	+
" " forma maxima J. Ag.			+			+
" Linza (L.) J. Ag.	+	+	+	+	+	+
" marginata J. Ag.			+		+	+
" micrococca Kuetz.	+		+			
" " var. subsalsa Kjellm.			+			
" minima Naeg.	+					+
" percursa (Ag.) J. Ag.	+	+	+	+		+
" prolifera J. Ag.	+		+	+	+	+
" ramulosa (Eng. Bot.) Hook.			+			
" torta (Mert.) Reinbold.	+					
Entoderma Wittrockii (Wille) Lagerh.			+			+
Epicladia Flustrae Reinke.	+	+	+			+
Gloeocystis zostericola Farlow.				+		
Gomontia polyrhiza (Lagerh.) Born. & Flah.	+		+	+	+	+
Ilea fulvescens (Ag.) J. Ag.	+	+	+	+		+
Monostroma crepidinum Farlow.			+	+	+	+
" fuscum (Post. & Rupr.) Wittr.	+	+	+			
" Grevillei (Thuret) Wittr.	+		+	+	+	+
" Groenlandicum J. Ag.			+			
" latissimum (Kuetz.) Wittr.			+	+		+
" leptodermum Kjellm.			+			
" pulchrum Farlow.			+		+	+
" undulatum Wittr. var. Farlowii Foslie.			+			
" Vahlii J. Ag.			+			
Pilinia maritima (Kjellm.) Rosenvinge.	+					

	Me.	N. H.	N. Mass.	S. Mass.	R. I.	Conn.
Prasinocladus subsalsus Davis.			+			
Pringsheimia scutata Reinke.	+			+		+
Protoderma marinum Reinke.						+
Rhizoclonium Kerneri Stockmayer.	+	+	+			
" riparium (Roth) Harv. var. implexum Rosenvinge.	+	+	+	+	+	+
" riparium var. polyrhizum Rosenvinge.	+				+	+
" tortuosum Kuetz.	+	+	+	+		+
" " var. polyrhizum Holden.						+
Schizogonium laetevirens Kuetz.	+					
Ulothrix collabens (Ag.) Thuret.			+			
" flacca (Dillw.) Thuret.	+	+	+	+	+	+
" implexa Kuetz.			+	+	+	+
" variabilis Kuetz. var. marina Wille. .						+
Ulva Lactuca (L.) Le Jolis.	+	+	+	+	+	+
" " var. mesenteriformis (Roth) Collins.						+
" " var. rigida (Ag.) Le Jolis. . .	+	+	+	+	+	+
Urospora penicilliformis (Roth) Aresch. . . .	+	+	+	+	+	+
Vaucheria litorea Nordst.	+		+	+		+
" piloboloides Thuret.						+
" " var. compacta Collins. .			+			
" Thuretii Woronin.	+		+	+		+
PHAEOPHYCEAE.						
Agarum Turneri Post. & Rupr.	+	+	+			
Alaria esculenta (L.) Grev.	+	+	+		+	
" Pylaii Grev.	+		+			
Arthrocladia villosa (Huds.) Duby.				+	+	
Ascocyclus orbicularis (J. Ag.) Magnus. . . .	+	+	+	+	+	+
Ascophyllum Mackaii (Turn.) Holmes & Batters.				+		+
" nodosum (L.) Le Jolis. . . .	+	+	+	+	+	+
Asperococcus echinatus (Mert.) Grev. . . .	+	+	+	+	+	+
Castagnea virescens (Carm.) Thuret.	+	+	+	+	+	+
" Zosterae (Mohr) Thuret.	+		+			
Chorda Filum (L.) Stack.	+	+	+	+	+	+
" tomentosa Lyng.			+	+	+	
Chordaria flagelliformis (Fl. Dan.) Ag. . . .	+	+	+	+	+	+
" " var. densa Farlow. . .			+		+	
Cladostephus spongiosus (Lightf.) Ag. . . .				+	+	
" verticillatus (Lightf.) Ag. . . .				+	+	+
Desmarestia aculeata (L.) Lamour.	+	+	+	+	+	+

	Me.	N. H.	N. Mass.	S. Mass.	R. I.	Conn.
Desmarestia viridis (Fl. Dan.) Lamour. . . .	+	+	+	+	+	+
Desmotrichum Balticum Kuetz.	+					+
" undulatum (J. Ag.) Reinke. .	+	+	+	+	+	+
Dictyosiphon Ekmani Aresch.	+		+			
" foeniculaceus (Huds.) Grev. . .	+	+	+	+	+	+
" " var. Americanus Collins. . . .				+	+	+
" hippuroides (Lyng.) Aresch. . .	+	+	+		+	
" " var. fragilis (Harv.) Kjellm. . . .	+		+			
" hispidus Kjellm.	+		+			
" Macounii Farlow.	+					
Ectocarpus aecidioides Rosenvinge.	+		+		+	
" confervoides (Roth) Le Jolis. . .	+	+	+	+	+	+
" " var. hiemalis (Crouan) Kuckuck.. . . .			+	+		
" " var. subulatus Hauck.						+
" " var. brumalis Holden.						+
" dasycarpus Kuckuck.				+	+	
" elegans Thuret.				+		
" fasciculatus Harv.	+	+	+	+	+	
" granulosus (Eng. Bot.) Ag. . . .			+	+	—	
" " var. tenuis Farlow. . .		—		+	+	
" lutosus Harv..				+		
" Mitchellae Harv.				+	+	
" ovatus Kjellm.				+		
" penicillatus J. Ag.				+	+	+
" siliculosus (Dillw.) Ag.	+		+	+	+	+
" subcorymbosus Farlow.			+			+
" terminalis Kuetz.		+	+		+	+
" tomentosoides Farlow.			+			
" tomentosus (Huds.) Lyng. . . .	+	+	+	+	+	+
Elachista fasciculata var. major (Reinke) Gran.	+					
" fucicola (Velley) Fries.	+	+	+	+	+	+
" lubrica Rupr.	+					
" stellaris var. Chordae Aresch. . . .				+		
Fucus Areschougii Kjellm.	+		+			
" ceranoides L.				+		+
" edentatus De la Pyl.	+	+	+	+	+	+
" evanescens Ag.	+	+	+	+	+	+
" filiformis Gmelin.	+	+	+			
" platycarpus Thuret.	+		+	+	+	+
" vesiculosus L.	+	+	+	+	+	+

	Me.	N. H.	N. Mass.	S. Mass.	R. I.	Conn.
Fucus vesiculosus var. sphaerocarpus Farlow.	+		+			+
" " var. spiralis Farlow.			+	+		+
" " var. gracillimus Collins.				+		
Halothrix lumbricalis (Kuetz.) Reinke.	+		+		+	+
Haplospora globosa Kjellm.				+		
Hecatonema maculans (Collins) Sauvageau.	+		+			
Isthmoplea sphaerophora (Harv.) Kjellm.			+			
Laminaria caperata De la Pyl.	+	+	+			
" digitata (L.) Lamour. var. typica Foslie.	+		+	+	+	+
" " var. complanata Foslie.	+		+			
" " var. ensifolia (Kuetz.) Foslie.	+		+			
" intermedia var. cucullata Foslie.						+
" " var. longipes Foslie.						+
" " var. ovata Foslie.					+	+
" longicruris De la Pyl.	+	+	+		+	+
" Phyllitis (Stack.) Lamour.		+	+	+	+	+
" Platymeris De la Pyl.	+	+	+			
" saccharina (L.) Lamour.	+	+	+	+	+	+
" stenophylla (Harv.) J. Ag.	+		+			
Leathesia difformis (L.) Aresch.	+	+	+	+	+	+
Mesogloia divaricata (Ag.) Kuetz.	+		+	+	+	+
Microspongium gelatinosum Reinke.	+					
Myriactis pulvinata Kuetz. var. minor Farlow.				+		
Myrionema Balticum (Reinke) Foslie.			+			
" foecundum (Stromf.) Foslie.					+	+
" globosum (Reinke) Foslie.			+			
" vulgare Thuret.	+	+	+	+	+	
Myriotrichia clavaeformis Harv.			+	+	+	
" filiformis Harv.	—		+	+	+	
Phaeosaccion Collinsii Farlow.			+			
Phyllitis fascia (Fl. Dan.) Kuetz.	+	+	+	+	+	+
" zosteraefolia Reinke.			+			
Punctaria latifolia Grev.	+		+	+	+	+
" plantaginea (Roth) Grev.	+	+	+	+	+	+
Pylaiella littoralis (L.) Kjellm.	+	+	+	+	+	+
" " var. fluviatilis Hauck.			+			
" " var. robusta Farlow.	+		+	+	+	
" " var. varia Kjellm.	+					
Ralfsia Borneti Kuckuck.	+					+
" clavata (Carm.) Farlow	+	+	+	+	+	
" deusta J. Ag.	+	+	+			

	Me.	N. H.	N. Mass.	S. Mass.	R. I.	Conn.
Ralfsia pusilla (Stromf.) Holmes & Batters.	+		+		+	
" verrucosa Aresch.	+	+	+	+	+	+
Saccorhiza dermatodea (De la Pyl.) J. Ag.	+	+	+			
Sargassum bacciferum (Turn.) J. Ag.				+		
" Filipendula Ag.				+	+	+
" " forma subedentatum J. Ag.				+	+	+
Scaphospora Kingii Farlow.				+		
Scytosiphon lomentarius (Lyng.) J. Ag.	+	+	+	+	+	+
" " var. complanatus Rosenvinge.						+
Sorocarpus uvaeformis Prings.				+		
Sphacelaria cirrhosa (Roth) Ag.			+	+	+	+
" racemosa Grev. var. arctica (Harv.) Reinke.	+					
" radicans (Dillw.) Ag.	+	+	+	+	+	+
Stictyosiphon Griffithsianus (Le Jolis) Holmes & Batters.	+		+			
" subsimplex Holden.						+
Stilophora rhizodes (Ehrh.) J. Ag.				+	+	+
Streblonema Chordariae (Farlow) De Toni	+			+	+	
" fasciculatum Thuret.	+					
" reptans. (Crouan) Farlow.			+		+	+
Striaria attenuata Grev.				+	+	
Rhodophyceae.						
Actinococcus subcutaneus (Lyng.) Schmitz.	+	+	+	+	+	+
" aggregatus Schmitz.				+		
Agardhiella tenera (J. Ag.) Schmitz.			+	+	+	+
Ahnfeltia plicata (Turn.) Fries.	+	+	+	+	+	+
Antithamnion Americanum (Harv.) Farlow.			+	+	+	+
" boreale (Gobi) Kjellm.	+		+			
" cruciatum (Ag.) Naeg.				+	+	+
" " var. radicans J. Ag.				+		
" floccosum (Muell.) Kleen.	+		+			
" plumula (Ellis) Thuret.				+	+	
" Pylaisei (Mont.) Kjellm.	+		+		+	
Bangia ciliaris Carm.			+		+	+
" fusco-purpurea (Dillw.) Lyng.	+		+	+	+	+
Bostrychia rivularis Harv.						+
Callithamnion Baileyi Harv.	—		+	+	+	+
" " var. boreale Harv.			+			
" " var. laxum Farlow.				+	+	
" " var. Rochei Harv.				—		

	Me.	N. H.	N. Mass.	S. Mass.	R. I.	Conn.
Callithamnion byssoideum Arn.			+	+	+	+
" " var. unilaterale Harv.			+	+		
" corymbosum (Eng. Bot.) Ag.			+	+	+	+
" " var. secundatum Harv.			—			
" roseum (Roth.) Harv.				+	+	+
" tetragonum (With.) Ag.				+	+	+
Callymenia reniformis (Turn.) J. Ag.			+			
Caloglossa Leprieurii (Mont.) J. Ag.						+
Ceramium arborescens J. Ag.	+		+	+	+	
" Capri-Cornu (Reinsch) Farlow.						+
" circinatum (Kuetz.) J. Ag.						+
" fastigiatum Harv.			+	+	+	+
" Hooperi Harv.	+		+			
" pedicellatum J. Ag.					+	
" rubrum (Huds.) Ag.	+	+	+	+	+	+
" " var. corymbosum J. Ag.			+			+
" " var. decurrens (Kuetz.) Harv.				—		+
" " var. proliferum Harv.					—	+
" " var. secundatum (Lyng.) Harv.	+		+			+
" squarrosum (Harv.) J. Ag.			+			
" strictum (Kuetz.) Harv.	+	+	+	+	+	+
" tenuissimum (Lyng.) J. Ag.				+	+	+
" " var. arachnoideum (J. Ag.) Farlow.			—		+	+
" " var. patentissimum Harv.			—	+	+	
Champia parvula (Ag.) Harv.			+	+	+	+
Chantransia Daviesii (Dillw.) Thuret.	+		+	+	+	
" secundata (Lyng.) Thuret.	+	+				+
" Thuretii Bornet mss.			+	+		
" virgatula (Harv.) Thuret.	+	+	+	+	+	+
Chondria dasyphylla (Woodw.) Ag.				+	+	+
" sedifolia Harv.				+	+	
" tenuissima (Good. & Woodw.) Ag.			+	+	+	+
" " var. Baileyana (Harv.) J. Ag.			+	+	+	+
Chondrus crispus (L.) Stack.	+	+	+	+	+	+
Choreocolax Polysiphoniae Reinsch.	+		+		+	+
Corallina officinalis L.	+	+	+	+	+	+
" " var. profunda Farlow.			+			
" " var. spathulaeformis (Kuetz.) Ardissone.	+				+	
Cystoclonium purpurascens (Huds.) Kuetz.	+	+	+	+	+	+
" " var. cirrhosum Harv.	+	—	+	+	+	+
Dasya elegans (Mart.) Ag.			+	+	+	+

	Me.	N. H.	N. Mass.	S. Mass.	R. I.	Conn.
Delesseria alata (Huds.) Lamour.	+	+	+			
" angustissima Griff.			+			
" sinuosa (Good. & Woodw.) Lamour.	+	+	+	+	+	+
Erythrotrichia ceramicola (Lyng.) Aresch. . .	+		+	+	+	+
Euthora cristata (L.) J. Ag.	+	+	+		+	
Gelidium crinale (Turn.) J. Ag.	—		+	+	+	+
Gigartina mamillosa (Good. & Woodw.) J. Ag.	+	+	+	+	+	
Gloiosiphonia capillaris (Huds.) Carm. . . .	+	+	+	+	+	+
Goniotrichum elegans (Chauv.) Le Jolis. . .				+	+	+
" ramosum (Thwaites) Hauck. .			+			+
Gracilaria multipartita (Clem.) Ag.				+	—	+
" " var. angustissima Harv.			+	+	+	+
Griffithsia Bornetiana Farlow.			+	+	+	+
" tenuis Ag.				+		
Grinnellia Americana (Ag.) Harv..			+	+	+	+
Gymnogongrus Griffithsiae (Turn.) Mart. . .				+	+	
" Norvegicus (Turn.) J. Ag. . .	+		+			
Halosaccion ramentaceum (L.) J. Ag. . . .	+	—	+			
" " var. gladiatum Eaton	+					
" Scopula Stromf.	+					
Harveyella mirabilis (Reinsch) Schmitz. . .	+		+	+	+	
Hildenbrandia Prototypus Nardo.	+	+	+	+	+	+
Hypnea musciformis (Wulf.) Lamour. . . .				+	+	
Lithothamnion circumscriptum Stromf. . . .	+					
" colliculosum Foslie.	+		+			
" compactum Kjellm.	+	+	+			
" evanescens Foslie.	+					
" flabellatum Rosenvinge. . . .	+					
" foecundum Foslie.	+					
" laeve (Stromf.) Foslie. . . .	+		+			
" laevigatum Foslie.	+					
" Lenormandi (Aresch.) Foslie. .	+		+			+
" Norvegicum (Aresch.) Kjellm.	+					
" polymorphum (L.) Aresch. . .					+	
" Ungeri Kjellm.	+					
" " var. fastigiatum Foslie. .	+	+				
Lomentaria rosea (Harv.) Thuret.		—	+	+	+	
" uncinata Menegh.			+	+	+	+
" " var. filiformis Harv. . .				+	—	
Melobesia Corallinae Crouan.				+		
" farinosa Lamour.			+	+	+	
" Lejolisii Rosanoff.	+	+	+	+	+	+
" macrocarpa Rosanoff.			+	+		

	Me.	N. H.	N. Mass.	S. Mass.	R. I.	Conn.
Melobesia membranacea (Esper) Lamour. . .			+	+	+	
" pustulata Lamour.		+	+	+	+	
Nemalion multifidum (Web. & Mohr) J. Ag. .	+	+	+	+	+	+
Nemastoma Bairdii Farlow.				+		
Petrocelis cruenta J. Ag.	+	+	+	+		
Peysonnellia Rosenvingii Schmitz.	+		+			
Phyllophora Brodiaei (Turn.) J. Ag.	+	+	+	+	+	+
" membranifolia (Good. & Woodw.) J. Ag.	+	+	+	+	+	+
" Traillii Holmes.	+	+	+	+	+	+
Pleonosporium Borreri (Eng. Bot.) Naeg. . .				+	+	+
Plumaria elegans (Bonnem.) Schmitz. . . .	+	+	+	+	+	+
Polyides rotundus (Gmel.) Grev.	+	+	+	+	+	+
Polysiphonia atrorubescens (Dillw.) Grev. . .			+	+	+	+
" elongata (Huds.) Harv. . . .			+	+	+	+
" fastigiata (Roth) Grev.	+	+	+	+	+	+
" fibrillosa (Dillw.) Grev.			–	+	+	+
" Harveyi Bailey.	+	+	+	+	+	+
" nigrescens (Dillw.) Grev. . . .	+	+	+	+	+	+
" " var. affinis Harv. . .			+	+	+	+
" " var. Durkeei Harv. .				+	+	+
" " var. fucoides Harv. .			+	+	+	+
" Olneyi Harv.	+	+	+	+	+	+
" subtilissima Mont.	+		+		+	+
" urceolata (Lightf.) Grev. . . .	+	+	+	+	+	+
" " var. formosa (Suhr) Ag.				+	+	+
" " var. patens (Dillw.) Grev.	+	+	+	+	+	
" variegata (Ag.) Zan.			+	+	+	+
" vestita J. Ag.				+		
" violacea (Roth) Grev.	+	+	+	+	+	+
" " var. flexicaulis Harv. .			+	+		
Porphyra coccinea J. Ag.		+				
" laciniata (Lightf.) Ag.	+	+	+	+	+	+
" leucosticta Thuret.			+	+	+	+
" miniata Ag.	+	+	+			
Ptilota pectinata (Gunner) Kjellm.	+	+	+	+	–	+
Rhodochorton membranaceum Magnus. . . .	+	+	+			+
" parasiticum Holmes.		+	+			
" Rothii (Eng. Bot.) Naeg. . .	+	+	+		+	+
Rhodomela Rochei Harv.				+	+	+
" subfusca (Woodw.) Ag.	+	+	+	+	+	
" " var. gracilis (Harv.) J. Ag.			+	+	+	
" virgata Kjellm.				+	+	

	Me.	N. H.	N. Mass.	S. Mass.	R. I.	Conn.
Rhodophyllis dichotoma (Lepechin) Gobi. .			+			
Rhodymenia palmata (L.) Grev.	+	+	+	+	+	+
" " var. latifolia Rosenvinge.			+		+	
" " var. Sarniensis (Mert.) Grev.	+					
Scinaia furcellata (Turn.) Bivona.				+	+	+
Seirospora Griffithsiana Harv.				+	+	+
Spermothamnion Turneri (Mert.) Aresch. . .				+	+	+
Spyridia filamentosa (Wulf.) Harv.				+	+	+
Sterrocolax decipiens Schmitz.	+				+	+

The Teaching Botanist[1] by W. F. Ganong, Ph.D., of Smith College, is really two books in one. Part I consists of a series of eight essays on botanical pedagogics. These are all good but those on the following topics are pre-eminently valuable: What Botany is of most worth? Things essential to good Botanical Teaching; Botanical Collections and other Illustrations; Some common Errors. It would be hard to find a secondary school teacher of botany anywhere who would not profit greatly by reading and digesting these brief essays. They abound in breezy, scientific common sense and suggest much that is new to most teachers.

Part II contains a scheme for a year's work in the laboratory. It deals largely with the physiological and somewhat with the ecological side of botany; the aspects most interesting to the average student. Many of the experiments and manipulations are wholly new, at least as regards their form, and the whole series is a practicable one. — J. Y. B.

1 Duodecimo, viii and 270 pp. Macmillan & Co., New York, 1899.

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Rhodora

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THE HEATHER IN NEW ENGLAND.

Wm. P. Rich.

On the twenty-fourth of September, 1899, the writer, happening to be in Tewksbury, Mass., visited the location of the Heather (*Calluna vulgaris*, Salisb.), and it may be desirable to put on record the present condition of this interesting plant as well as some observations on the vexed question of its origin.

Contrary to our usual experience in such matters, no difficulty was met with in finding the place where it grew, so well was the plant known in the town.

It grows upon a hillside pasture sloping gradually down to boggy ground through which a deep channel has been cut by a brook. In the higher part of this pasture a few scattered patches of the plant were noticed, possibly transplanted from the main body of the Heather, and from their feeble appearance seemingly doomed to early extinction. The principal growth was in the lower part of the pasture, on the borders of the brook, where the plants were growing quite thickly in a space about thirty feet square, which was inclosed by a wire fence. At the time of our visit a cow was standing in the midst of the precious shrubs, an invasion not likely to be soon repeated, for visiting the place a second time, some two weeks later, we found the fence had been repaired, showing the watchful care of some interested person over this rare plant. The shrubs were mostly in advanced fruit, although a few of their pretty rose-colored flowers still lingered as a sample of its beauty a month before.

In the thirty-eight years which have elapsed since public attention was first called to the Heather in this locality, the area of its growth has been much reduced, judging from the description published at the

time, and that it is still in existence is doubtless due to the protection which has been afforded it. Since its discovery here several other stations have been found for the Heather in New England. It has been reported from Cape Elizabeth, Maine, from West Andover, Townsend, and Nantucket, Massachusetts, and also from Rhode Island.

In most of these locations careful investigation has failed to prove its introduction by human agency and this has led numerous writers on the subject to claim for it an indigenous origin. Although its early history in New England is shrouded in obscurity, and desirable as it would be to place the Heather on our list of native plants, it must be said, after a careful reading of the literature of the subject, that no satisfactory evidence has accumulated during the years that have passed since its discovery on this continent to substantiate its claim as a plant native to America.

The circumstance that in some instances, as at Townsend, Massachusetts, it has been traced to the planting of seed, and especially the fact that although many wild regions in America seem favorable for its development it has never been found at points remote from human habitation, are much against the theory of its indigenous character.

The occurrence of the Heather in Nova Scotia, Newfoundland, and Greenland has been adduced as strong evidence in favor of believing the plant native in America. But Nova Scotia was settled in part by Scotch, who would have been particularly likely to introduce the Heather accidentally if not purposely; while in Newfoundland — a region of great stretches of open moorland and seemingly an ideal habitat for the Heather, — the plant has only been found in a few patches about the settlements on the southeastern coast, the most thickly populated part of the island. Finally the occurrence in Greenland, although reported, could not be confirmed by Lange, the author of the most complete flora of that region. It will thus be seen that these northern occurrences add little to the evidence, that the Heather is an indigenous American plant.

BARTONIA IODANDRA, — A SPECIES NEW TO THE UNITED STATES.

EMILE F. WILLIAMS.

(Plate 15, figs 1–7.)

ON September 23, 1894, while botanizing in the Blue Hills Park Reservation, near Boston, Dr. Geo. G. Kennedy and the writer collected several plants of Bartonia, which, to their surprise, were growing in sphagnum in a cedar swamp. Their appearance was altogether different from that of *Bartonia tenella*, a species very common in this region, but as Gray's Manual provided no other berth for them, I referred them to this species, thinking the difference in appearance might be due to the unusual habitat in which I found them. Hitherto I had always collected Bartonias in dry cranberry bogs, in pastures and springy fields and even once on a sunburnt ridge of Green Mountain, at Mt. Desert, but never before in deep shade nor in peat moss.

In August, 1894, Dr. B. L. Robinson and Mr. H. von Schrenk secured some specimens of a Bartonia in a small sphagnum bog near Holyrood, on Conception Bay, Newfoundland. These specimens were at first taken to be the obscure species *Centaurella Moseri*, Steud. & Hochst., and as Centaurella had long since been reduced to Bartonia, the plants were distributed as *Bartonia Moseri*, Rob. & Schrenk; but in July, 1898, Dr. Robinson found it necessary to place them in a new species which he called *Bartonia iodandra*,[1] from the purple color of the anthers.

I had never felt satisfied with the disposition made of my Blue Hills specimens, and having occasion lately to visit the Gray Herbarium, I submitted my material to Dr. Robinson, who pronounces it to be *Bartonia iodandra*. My specimens, however, have yellow anthers, but in other respects the flower agrees perfectly with the type specimens from Newfoundland. Their habit likewise is the same, only they are much larger. The Newfoundland type is described as a delicate annual 4 to 12 cm. high, my plants are 12 to 25 cm. high.

Bartonia tenella is usually an erect plant 6 to 20 cm. high, and the stem is either single or divided near the base into two, three or four erect branches. The base is more or less thickly covered with bract-like, mostly opposite scales. The flowers are terminal on short, mostly

[1] Botan. Gazette, Vol. 26, pp. 46–48, July, 1898.

opposite branches or peduncles which are seldom 5 mm. long. Some plants which I collected on Cape Cod have opposite branches above, and the flowers are opposite and closely racemose on the ends of these branches. The corolla is one and one-half times the length of the calyx, its segments are rather blunt and often slightly denticulate. The stigma, about 2 mm. long, is slightly exserted.

Bartonia iodandra, on the other hand, is erect, from a more or less decumbent base, but my largest specimen which is 25 cm. high was somewhat nodding. The general appearance of the plant is straggling whereas that of *B. tenella* is very erect and strict. The stem is single in every specimen I have seen and either lacks entirely the basal scales or has only a few, widely separated and alternate. The branches or peduncles are mostly alternate, erect or curved-ascending, 1 to 6 cm. long. The flowers are terminal and somewhat larger than those of *B. tenella*. The corolla is twice the length of the calyx and its lobes are lanceolate and entire. The stigma is short and thick and mostly included within the corolla.

I have said above that the anthers in my specimens are yellow, so that if my plants are *B. iodandra*, as they appear to be, this character is not to be relied upon.

B. iodandra varies from *B. tenella* in appearance, in habitat, in the basal scales, length of peduncles, length of corolla and shape of its lobes, and in the stigma, an array of differences which ought certainly to constitute a valid species. Of the real *B. Moseri* (*Centaurella Moseri*, Steud. & Hochst.) we know very little. In the only specimen which I have seen, which is in the Gray Herbarium, collected by Drummond at Covington, Louisiana, the habit is entirely different from that of either *B. tenella* or *iodandra* and the flowers are very small, hardly half the size of those of *B. iodandra*. To determine whether there is any affinity between this species and *B. tenella* or *iodandra* it will be necessary to have more and better material.

B. iodandra was also collected at Grand Lake, Newfoundland, by Rev. A. C. Waghorne, in August, 1897, and at Cape Breton Island, in August, 1898, by Prof. John Macoun. There is also a specimen in the Gray Herbarium from the herbarium of William Boott, collected in October, 1859, at Weymouth, N. J., which is undoubtedly referable to *B. iodandra*. This New Jersey station and that in the Blue Hills are the only ones within the United States known to the writer, and it is hoped, now that their attention is called to it, that collectors may re-

port their discoveries, so that more knowledge may be obtained of the range of this interesting little plant.

BOSTON.

EXPLANATION OF PLATE 15, figs. 1–7. Fig. 1, *Bartonia tenella*, habital sketch; fig. 2, same, corolla-lobes. Fig. 3, *B. iodandra*, one of the original Newfoundland specimens; fig. 4, corolla-lobes of same. Fig. 5, *B. iodandra*, a specimen from the Blue Hill station. Fig. 6, *B. Moseri*, a specimen from Covington, La.

A LITTLE-KNOWN NEW ENGLAND GOLDENROD.

C. B. GRAVES.

ON October 1st, 1898, specimens of a peculiar Solidago were collected by the writer on the gravelly terrace bordering Poquonnoc River, Groton, Connecticut. The same form was found again last September both at the locality above mentioned and on an open, rocky hillside near the shore, some miles further east. The plant was fairly abundant at both stations, growing with *S. rugosa* Mill., *S. Canadensis* L., *S. sempervirens* L., and *S. juncea* Ait., but having manifest points of difference from all those species.

Careful examination of this material led to the conclusion that it represented a species distinct from any described in the current manuals.

Through the kindness of Mr. Fernald, who examined some of these specimens, I have learned that at various times during a considerable period of years plants seemingly identical with these have been found at several points in eastern Massachusetts. This form was probably referred to by Young in his Flora of Oak Island, Revere, Mass. (1882), as "*Solidago sp.?* Perhaps a cross between *S. sempervirens* and *S. altissima*." This Oak Island station was rediscovered in recent years by Mr. Wm. P. Rich, of Boston, to whom I am greatly indebted for information upon the plant in Massachusetts. What is apparently the same form has been collected also in Medford, Malden, and Winthrop, Mass.

Dr. Gray, to whom most of these Massachusetts specimens were submitted, classed them doubtfully as hybrids between *S. rugosa* Mill. and *S. sempervirens* L. Later students, however, have been more inclined to regard this form as entitled to specific rank. Mr. Wm. P. Rich, who has a thorough field knowledge of the Oak Island plant, has

for several years maintained this view, — an opinion held also by Mr. Fernald. In fact, anyone observing this form attentively in the field could, it seems to me, hardly regard it as other than a good species.

From his study of all this material, Mr. Fernald considers it satisfactorily referable to *Solidago asperula* Desfontaines. Comparison with authentic specimens from the Paris Garden leaves no reasonable doubt that these interesting New England forms are — at least in part, probably all — included in *S. asperula*. That name should, therefore, be reinstated as representing this specific type.

The original description of Desfontaines is as follows:

SOLIDAGO ASPERULA. Caule villoso, asperulo; foliis lanceolatis, levissime serrulatis; racemis elongatis, patulis; floribus secundis.

Caulis 3–4-pedalis, hirsutis, pilis brevibus, asperulis. Folia lanceolata, glabra, levissime serrulata. Flores racemosi, terminales. Racemi longi, paniculati, patentes. Flores numerosi, parvi, secundi, lutei. Rami pubescentes. — Desf. Cat. ed. 2, 403.

From recent material the species may be characterized as follows:

Stems from horizontal rootstocks, rather stout, erect, 2½ to 4½ feet tall, simple or branched at the summit, commonly deep purple, papillose, slightly scabrous to moderately pubescent, very leafy; branches leafy, papillose pubescent with short whitish hairs; leaves absent or shrivelled at and near base of stem at flowering time, largest below (4 to 7½ inches long, ¾ to 1½ inches wide), erect or ascending, thickish and usually somewhat rugose, smooth scabrous or sparingly pubescent, pinnately veined, rarely somewhat triple-nerved, oblong or elliptical-lanceolate to linear-lanceolate, acute, sessile or the lower tapering into margined petioles, entire to sharply serrate, the margins very rough; leaves of branches much smaller, passing into the bracts of the racemes; inflorescence paniculate, varying from simple small and close to large open and compound forms, often markedly corymboid; racemes densely or loosely flowered, strongly secund, often recurved, pubescent with whitish hairs; heads comparatively large (2½ to 3½ lines high); involucral scales imbricate in 4 to 5 rows, cilate, the outer herbaceous, lanceolate-subulate, acute, puberulent on the back, the inner oblong-lanceolate to linear-oblong, obtuse or obtusish with scarious margin and tip, smooth or minutely scabrous on the back; rays 8 to 16 (usually 10 to 13), golden yellow, large (1–1⅜ lines x ⅜–⅝ line); disc flowers 6 to 14 (usually 8 to 11), their corollas tubular campanulate, abruptly contracted midway; achenes pubescent (about 1 x ¼ line), linear oblong, slightly flattened.

Hab. Eastern Massachusetts and southeastern Connecticut in dry or dryish open soil.

In bloom during the last three weeks of September, most of the

plants being in best flowering condition during the second or third week, but a few prolonging its season into the first week of October. The discs, which at first are yellow, turn as they mature a purplish brown before any change takes place in the rays; thus flowers which have somewhat passed their prime show a marked color contrast between rays and discs.

Solidago asperula Desf. as here treated is a variable species, including several more or less well-marked forms. In the field, however, it has an aspect of its own, and is almost always easily recognizable at sight.

Its nearest relative is *S. rugosa* Mill., which also it most resembles in habit, but it is readily distinguished from that species by its smoother stem, its longer, smoother, less rugose, more erect leaves, and its much larger heads, with more numerous ample rays.

S. ulmifolia Muhl. inhabits wet ground, blooms a month or more earlier, and furthermore differs from *S. asperula* in its smooth stem and small heads, with few rays.

From *S. sempervirens* L. it is easily separated by its more slender, rougher stem, its thinner, smaller usually serrate leaves, its more open, broader panicle, and its smaller heads. Moreover, the seaside goldenrod has usually an abundance of basal leaves at flowering time, which is not the case with *S. asperula*.

Some forms suggest *S. Canadensis* L., because of their narrower somewhat triple-nerved leaves, but they are never as distinctly 3-ribbed as in that species. It is further distinguished from *S. Canadensis* by its smoother stem and leaves, and larger heads, with numerous broad rays.

From *S. Elliottii* Torr. & Gray its more or less rough papillose stem, its longer, narrower more erect leaves, the lower of which are often petioled, its broad rays, and its open paniculate or corymbose-paniculate inflorescence serve to differentiate it. Furthermore, *S. Elliottii* is an inhabitant of wet meadows and swamps, while *S. asperula* seems to prefer dry or dryish soil.

The writer is under great obligation to Mr. M. L. Fernald of the Gray Herbarium for indispensable aid in the preparation of this paper.

THE RE-DISCOVERY OF ELEOCHARIS DIANDRA.

M. L. Fernald.

Nearly twenty years ago Charles Wright collected on high sand-bars of the Connecticut river, between Hartford and Wethersfield, a little spike-rush, which was unlike any other known species. Its most marked characteristic was the lack of bristles which, in this genus, usually occur at the base of the achene, probably representing the perianth of higher endogens. The plant was further distinguished by its very small inverted-pyriform achene, capped by a small compressed tubercle. After corresponding with Dr. Gray in regard to his plant, Mr. Wright in 1883 described it as *Eleocharis diandra*. Since then nothing has been known of the species except from the original specimens. Recently, however, Mr. C. H. Bissell, taking advantage of the extremely low water of the Connecticut in the fall of 1899, has explored the sand-flats along the river at East Windsor, Connecticut. There he finds the plant described by Wright, but most of the material differs markedly in habit from Wright's specimens. The original *Eleocharis diandra* was an erect plant with many slender culms. Though Mr. Bissell finds this erect plant, the common form at East Windsor has the culms decidedly prostrate and of very unequal lengths, a variation from the type parallel with *E. ovata*, var. *Heuseri* (see Contrib. Gray Herb. xv, Proc. Am. Acad. xxxiv, 486–489, 494). Assured by Mr. Bissell's re-discovery of this unique *Eleocharis*, President Ezra Brainerd felt that it should be expected along the entire Connecticut Valley. Accordingly as occasion has offered, he has looked in the proper situations for it at points in New Hampshire, Vermont and Massachusetts and finds at them all the same prostrate form which abounds on the sand at East Windsor.

This form, differing so strikingly in habit from the original erect plant of Charles Wright, may be called —

Eleocharis diandra, C. Wright, var. **depressa**. Culms of very various lengths, depressed and prostrate, forming flat rosettes. Sand-bars and flats of the Connecticut river, New Hampshire, Walpole, Sept. 30, 1899 (*Ezra Brainerd*): Vermont, Westminster, Sept. 30, 1899 (*Ezra Brainerd*): Massachusetts, Northampton, Oct. 11, 1899 (*Ezra Brainerd*): Connecticut, East Windsor, Sept. 17, 1899 (*C. H. Bissell*). A discussion and figures of Mr. Wright's species will be found in the paper by the present writer cited above (Contrib. Gray Herb. xv, 489, 496, figs. 53–58).

Gray Herbarium.

Eleocharis diandra in Central New York. — It will be interesting to all lovers of cyperaceous plants to know that the long-neglected and little-known *Eleocharis diandra*, so well described by Charles Wright, Bull. Torr. Club, x. 101, has at last been found in sufficient quantity to determine its merits as a good species, concerning which there can no longer be any doubt.

On making a thorough examination of some specimens of an Eleocharis, which I had gathered in July, 1883, on the sandy borders of Oneida Lake, in the towns of Verona, Oneida county, and Lenox, Madison county, and which had been taken to be a form of *E. intermedia* Schultes, I was at once attracted by the beautiful little *cuneate-obovate* achenes and lack of any bristles. My suspicions were aroused, and on referring to Mr. Fernald's Contributions from the Gray Herb. New Series, No. xv. 496, *E. diandra* C. Wright, with the accompanying plates, seemed to solve the doubt, and specimens were sent to Mr. Fernald, who has kindly verified the determination.

The plant was found in company with *Cyperus aristatus* Rottb. and *Hemicarpha subsquarrosa* Nees., and is very common in the Oneida Lake locality. Its recent re-discovery in the Connecticut Valley and my own finding of it at a station somewhat identical, confirms me in the opinion that it has merely been overlooked in other places, and that it will be found in intermediate and similar localities, and eventually receive the attention it deserves, and add honor to the memory of the lamented New England botanist, who first described the species. — Joseph V. Haberer, M. D., Utica, N. Y.

A LIST OF MOSSES COLLECTED AT KATAHDIN IRON WORKS, MAINE.

Elmer D. Merrill.

The following list of mosses and scale-mosses were collected in the vicinity of Katahdin Iron Works, during a stay of one day at that place, in November, 1898. This region appears to be very rich in moss flora, and it is a matter of regret that more time could not have been given to collecting at this place.

The species marked with an asterisk have never before been reported in print from the state, and the number of species new to the state in this short list, gives some idea of the amount of work yet to be

done in this group by Maine botanists. I am indebted to Prof. L. S. Cheney of the Univ. of Wisconsin, for various determinations.

The following five species were very abundant on wet soil about the iron deposit about a half mile from the Iron Works, and were the only species noticed at this place. The large amount of iron in the soil being apparently very favorable for their development.

Bryum caespiticium L. (no. 156).

**Dicranella cerviculata* Schimp. (no. 18).

**Ditrichum vaginans* (Sulliv.) Hampe. (no. 53).

Pogonatum tenue (Menzies) E. G. Britton (no. 180).

Chiloscyphus polyanthos (L.) Corda. (no. 19).

The remaining species listed below were mainly collected on Chairback Mountain, which has an altitude of about 2,000 feet and is nearly six miles from the Iron Works. As it was necessary to make this trip and return to the Iron Works in time to get the afternoon train, very little time could be given to collecting, and therefore the following list does not fully represent this region. Among the more notable species are *Amblystegium irriguum spinifolium* Schimp. and *Leskea nervosa* Myrin., the former being very rare in America.

**Amblystegium irriguum spinifolium* Schimp. (no. 319).

Andreæa petrophila Ehrh. (no. 3).

**Anomodon attenuatus* Hueben. (no. 267).

Anomodon apiculatus Br. & Sch. (no. 267).

Brachythecium campestre Br. & Sch. (no. 299).

Brachythecium Novæ-Angliæ (Br. & Sch.) J. & S.

Brachythecium oxycladon (Brid.) J. & S.

**Brachythecium populeum* (Hedw.) Br. & Sch.

Brachythecium salebrosum (Hoffm.) Br. & Sch.

Catharinea undulata (L.) Web. & Mohr. (no. 178).

Dicranum Bonjeani De Not. (no. 19).

Dicranum longifolium Ehrh.

Dicranum undulatum Ehrh.

Eurhynchium strigosum (Hoffm.) Br. & Sch. (no. 303).

Fissidens adiantoides (L.) Hedw. (no. 39).

Fontinalis antipyretica gigantea Sulliv. (no. 184).

Georgia pellucida (L.) Hedw. (no. 169).

Grimmia apocarpa gracilis (Schleich.) Web. & Mohr. (no. 88).

Hylocomium umbratum (Ehrh.) Br. & Sch. (no. 323.3).

Hypnum Crista-castrensis L. (no. 322.10).

Hypnum Haldanianum Grev. (no. 322).
Hypnum ochraceum Turn. (no. 322.11).
Leskea polycarpa Ehrh. (no. 265).
**Leskea nervosa* (Schwaegr.) Myrin.
Mnium sylvaticum Lindb. (no. 160).
Plagiothecium denticulatum (L.) Br. & Sch. (no. 314).
Plagiothecium turfaceum Lindb.
Pogonatum alpinum (L.) Roehl. (no. 180.)
Raphidostegium recurvans (Mx.) J. & S. (no. 307).
Rhynchostegium rusciforme (Neck.) Br. & Sch. (no. 305).
Sphagnum acutifolium (Ehrh.) Russ. & Warnst. (no. 4).
**Sphagnum acutifolium purpureum* Warnst.
Sphagnum acutifolium rubrum (Brid.) Warnst.
Thuidium delicatulum (L.) Mitt. (no. 274).
Thuidium recognitum (Hedw.) Lindb.
**Thuidium scitum aestivale* Aust.
Webera sessilis (Schmid.) Lindb. (no. 172).

SCALE-MOSSES.

Geocalyx graveolens (Schrad.) Nees (no. 17).
Plagiochila asplenioides (L.) Dum. (no. 20).
Scapania nemorosa (L.) Dum. (no. 15).
Trichocolea tomentella (Ehrh.) Dum. (no. 7).

WASHINGTON, D.C.

THE RELATION OF CERTAIN PLANTS TO ATMOSPHERIC MOISTURE.

ROBERT G. LEAVITT.

(Concluded.)

ORCHIDS (continued). A very few figures will convey a more precise idea of the behavior of cut roots in a humidity of from .90 to .95, mostly nearer the higher figure.

Species.	Wt. at start. Gms.	Time elapsed.	Conditions.	Loss. Gms.	Temperature.
Dendrobium nobile.	.535	24 hrs.	In lab.	.095	70° ±
	.440	46 hrs.	.95 ± hum.	.040	66°–69°
Dry weight	.340				
Burlingtonia decora.	.310	4 days	"	.040	"
Oncidium varicosum.	1.10	2 days	"	.08	"
Dry weight	.21				

The dry weight was determined after heating for a while in a sterilizing oven at above 100° C.

The *Dendrobium* root at the beginning of the test contained water to the amount of .36 + of the root's total weight. In 24 hours in a damp laboratory it lost .48 + of the above water. At once thereafter, in 46 hours in the damp-box it lost .40 of the water remaining. At the end of the test the water left in the root formed .15 of the total weight. The *Oncidium* root had been somewhat dried. Its percentage of water was then .80 +, but it lost water much less rapidly than the *Dendrobium*, the water still retained after 48 hours in the box being .79 of the whole weight. In a root of *Brassia Wrayae* the proportion of water had fallen from .78 to .73 of the whole weight after 46 hours in the box.

These figures indicate a very good reason why the roots used have no observable condensing power. Even when dry to the touch and apparently in condition to absorb vapor they still hold a considerable percentage of water. Their state is quite different from that of freshly prepared charcoal, for instance, the activity of which in absorbing gases is so remarkable. The walls of the velamen of the orchid root are already saturated with moisture drawn from the living cells; and in the cases under observation draw away and give off so much water that the living cells perish.

Whole plants were used as follows, the first method being that proposed by Dr. Goodale.

A young shoot of *Dendrobium nobile*, bearing two leaves less than two inches long, and provided with aërial roots aggregating 28 inches in length, was cut from the parent plant, the cut sealed, and the young plant left to dry for several days. Medium weight sheet rubber was tied over the mouth of an inverted beaker. Through a puncture the transpiring parts of the young *Dendrobium* were introduced into the space thus formed, and the receptacle was made as nearly air-tight as possible. While the roots were thus left free, and the shoot was under fairly normal conditions, no moisture could escape except from the roots. If these condensed vapor the plant and whole apparatus would gain weight. Calcium chloride in a test tube had been included along with the shoot in order to take up moisture evaporating from the leaves.

After weighing, this apparatus was set so that the roots of the plant hung in a box of the kind before described, the beaker and contained shoot being at the same time exposed to the light. A control appara-

tus, lacking a plant, was also used and weighed in the same way as the first. This suffered slight changes of weight, by evaporation from the rubber, but these were always trifling compared with the losses of the other contrivance.

The experiment was repeated with another young *Dendrobium* plant having three small leaves and 96 inches of roots. No calcium chloride was used.

The tests lasted four, five, and six days respectively. Every successive weighing showed a somewhat diminished weight. In three days, through the 28 inches of slender and dry roots of the first plant about .07 gram was lost. The second plant lost about the same amount in like condition in the same time. In both cases the leaves were transpiring; and the test was carried on until the second plant was plainly suffering for want of water, although the air about the roots was very nearly (.95) saturated with water-vapor.

These two Dendrobiums, with still a third, have been hung unprotected in a greenhouse where the atmosphere is well charged with moisture, and from time to time their weights have been determined. No. 1, though not watered for seven weeks, is green and healthy. The stem is somewhat shrivelled. It has lost .57 gram weight in the last 20 days, a little more than one-eleventh of the present gross weight. The others also slowly decline in weight.

It remains to be proved conclusively that the roots of any orchids possess a special condensing power. The fitness of the velamen for such a function may well be classed with the "evident" adaptations.

Tillandsia. A piece of *T. usneoides*, which had hung in the greenhouse, was tested in the damp-box in the same manner as the orchid roots. Tips here and there finally dried up and died, and the whole lost weight continuously for a long time. This plant probably has no power of absorbing water in the gas form.

Mosses. The reservoir-cells of *Sphagnum* and *Leucobryum* in some respects resemble the tracheid-like elements which give the covering of the orchid root its peculiar spongy character. Kerner attributes to them the same function, viz., the appropriation of water-vapor from the atmosphere at those seasons of the year when the supply from the ground is cut short by drought.

Leucobryum, sp. December 19, the moss was gathered in a dryish condition. It was left in the laboratory for two days, when it seemed very dry to the touch. It was then weighed and put into the box.

December 21, 9.30 A. M., it weighed .337 gram.
December. 22, 4.45 P. M., it weighed .230 gram.
December 28, the weight had not apparently changed.
Dry weight, .195. Humidity during test, about .93.

Thus in 31 hours the percentage of water fell from .42 to .15, when equilibrium was reached.

Sphagnum, sp. The material was picked from a recently collected but pretty dry heap of the moss, and the dead portions removed, leaving tips perhaps two inches long. One lot was weighed as it came from the shed — wt. .810 gram— and put into the box. In one day the weight fell to .555 gram. Then being dried out to .495 gram, and again subjected to the action of the moisture, the sphagnum increased its weight to .530 gram in six days, and .540 gram after a further exposure. Dry weight, .420 gram.

The second lot was kept in the laboratory for two days, when it seemed utterly dry to the touch, but was still alive and green. Weight, .620 gram. Seven days later it weighed .630 gram. Dry weight, .500 gram.

In both cases there was some intake of water-vapor. In one the percentage of water rose to .20, in the other to .22. At best the moss remained in a state of relative desiccation.

It was hard to believe that the power of vapor-absorption detected could be of any practical importance in the economy of the plant, at least under the natural conditions prevailing in this part of the world. This conclusion is confirmed by the following observation. Both *Sphagnum* and *Leucobryum*, killed and dried at 100° C. and then replaced in the moistening chamber, rapidly took up vapor. In less than 24 hours the water contents of the dead moss thus derived, equalled that left when the living plants were allowed to dry out for one or two days in the same receptacle.

Lichens. As compared with the other plants experimented upon, lichens show a considerable power of condensing atmospheric moisture. But though the absorption is enough to render lichens that come from outdoors in a harsh and brittle condition soft and flexible after a day or so, the highest proportion of water obtained by imbibition of vapor is very far below that which the lichens hold when well saturated by dew, rain, or soil-water.

The following figures will serve for illustration. *Usnea barbata* is the common much-branched lichen growing in tufts on the twigs and

trunks of trees. *Stricta pulmonaria* is a large thalloid, or flattened form clinging loosely on rough bark. "Wet weight" was taken after soaking in water and allowing to dry until no water appeared on the surface, "dry weight" after heating.

Species.	Wt. at start. Gms.	Time elapsed.	Humidity, etc.	Loss. Gms.	Gain. Gms.
Usnea barbata.	3.320	4 days.	.93–.95	.800	
	2.520	4 days.	In lab.	.485	
	2.035	3 days.	.93–.95		.245
Wet weight,	4.650				
Dry weight,	1.680				
Sticta pulmonaria.	2.320	1 day.	.93–.95.		.147
	"	25 days.	"		.250
Wet weight,	5.240				
Dry weight,	1.860				

One more table is added, designed to give a rough idea of the relative store of water retained after exposure in an atmosphere nearly saturated with water-vapor.

Species.	Percentage of water when well moistened.	Percentage after stay in box.	Time in days.
Usnea barbata.	.64	.26	+3
" "	.53	.20	+7
Cladonia rangiferina.		.20	+7
C. cristatella.		.25	±3 [1]
C. pyxidata,	.63	.22	–10
C. furcata.	.69	.36	–7
Baeomyces roseus.	.75	.20	–9
Parmelia caperata.	.54	.24	±3[1]
Sticta pulmonaria.	.66	.27	+25

The positive and negative signs in the last column indicate whether the lichen was originally dry and had gained weight, or moist and had lost weight.

The figures are not presented as in any sense physical constants, but merely to show in a general way the relation of some lichens to a possible source of replenishment of their water supply in cases of the failure of atmospheric precipitation. After long exposure to very moist air the lichens possessed, it will be seen, but a low proportion of water. In outdoor humidities this would be still less considerable, and the quantities of water received in the form of vapor must be next to nothing in very dry weather. On the other hand in damp weather

1 Two tests, three days losing, three days gaining; result about the same.

dew falls and is taken up in such measure by lichens that their tissues cannot be in condition to absorb vapor.

General Conclusions. Experiments have been made upon several classes of plants—some of them not mentioned above—which are asserted by one authority or another, of greater or less trustworthiness, to profit largely by their power of absorbing water in the gas form. A few figures, representative of a considerable number of tests, have been given in these notes. While these tests have seemed conclusive as regards the identical material employed, a much longer investigation would be required to enable one to make a general statement as to the direct utility of atmospheric moisture, as such, to actively vegetating plants. What I have seen tends to create in my own mind a doubt of any such utility.

The Ames Laboratory, North Easton.

FURTHER ADDITIONS TO THE FLORA OF THE AMHERST REGION.

Roland M. Harper.

On examining recently a copy of Tuckerman and Frost's Catalogue of plants growing without cultivation within thirty miles of Amherst College (1875), I found that several plants which I had collected or observed within the limits of this catalogue during the past season were not mentioned in it.

A circle of thirty miles radius, with Amherst College as its center, would include, along its eastern edge, the greater part of Sturbridge, the whole of Brookfield, and several other towns in Worcester and Hampden Counties which I explored more or less in 1899.

The plants listed below are from these towns, and unless otherwise noted are new to the "Amherst region." Stations enclosed in parentheses have been already mentioned in my last list of additions to the flora of Worcester County (Rhodora, **1**: 201–205), where further details concerning them may be found.

Potamogeton gemmiparus, Robbins. In Quaboag Lake, Brookfield, September 4 (altitude 615 feet). Also in a small pool in a meadow in Sturbridge, September 17 (altitude 560 feet). This species was collected in Amherst in September, 1874, by Prof. H. G. Jesup, but it

is not mentioned in Tuckerman's or any other list of the plants of that region. With this single exception, my two stations seem to be the farthest west of any of the few known stations for this plant.

Aristida gracilis, Ell. (Sturbridge).

Scirpus atrocinctus, Fernald. (New Braintree, Dana.)

Eriophorum gracile, var. *paucinervium*, Engelm. (Sturbridge.)

Carex bullata, Schk. Quaboag River marshes, West Brookfield, May 30 (altitude 610 feet). This species is perhaps more local in its distribution than might be supposed. It seems to be unknown in Vermont and Connecticut, and is considered very rare in New York (E. C. Howe in Rep. N. Y. Mus., **48**: 103).

Carex stricta, var. *strictior*, Dew. (Sturbridge.)

Carex muricata, L. Dry grassy roadside, Hardwick, July 2.

Juncus Greenii, Oakes & Tuckerm. (Brookfield.)

Juncus militaris, Bigel. In water 1–2 feet deep along the northern margin of Quaboag Lake, Brookfield, August 20 (altitude 615 feet).

Polygonum acre, var. *leptostachyum*, Meisn. (Brookfield.)

Polygonum Muhlenbergii, Wats. Lake shores, Brookfield, September 4.

Pyrus nigra, Sargent (*P. arbutifolia*, var. *melanocarpa*, Hook.) Sturbridge, May 28.

Elatine Americana, Arn. (Brookfield).

Sium Carsonii, Durand. Dunn Brook, Brookfield (altitude 625 feet), August 20; Honey Brook, Sturbridge, September 17.

Apocynum hypericifolium, Ait. (Brookfield.)

Myosotis laxa, Lehm. Dunn Brook, Brookfield, August 20.

Antennaria Parlinii, Fernald. (Sturbridge, Warren.)

Antennaria Canadensis, Greene. (Sturbridge.)

Antennaria neodioica, Greene. Sturbridge, Brookfield, West Brookfield, Warren, Brimfield.

Antennaria neglecta, Greene. Brookfield, Wales.

Bidens cernua, L. Margin of Quaboag Lake, Brookfield, September 4; wet meadow, Sturbridge, September 17.

The following plants which are not in Tuckerman and Frost's catalogue have been reported from the region by more recent writers (N. A. Cobb, List of plants found growing wild within thirty miles of Amherst, 1887; H. L. Clark, RHODORA **1**: 164), but as they probably are not generally distributed in this region, my stations for them may be of some interest: —

Trifolium hybridum, L. Roadsides, North Brookfield, June 18, New Braintree and Athol, July 2.

Carum Carui, L. Brookfield, May 30.

Clethra alnifolia, L. About ponds, lakes, and rivers, Sturbridge and Brookfield. Though quite common in Worcester County, this plant probably reaches its inland limit in the Amherst region.

Bidens Beckii, Torr. Quaboag Lake, Brookfield, September 4. (Shown to me by Dr. G. E. Stone.) All the specimens seen were sterile.

Columbia University.

Polymnia Canadensis in Vermont. — In the sixth edition of Gray's Manual *Polymnia Canadensis*, L., is reported from Western Vermont and Connecticut, while in the Illustrated Flora western Ontario, is assigned as the eastern limit of the plant. Diligent inquiry regarding the station in Vermont, failed to show upon what foundation the report in Gray's Manual rested. Fortunately, however, the occurrence of the species within the state was settled last August, by the discovery of a fine station at the base of limestone cliffs at Double Road Crossing, plants being found both in Rutland and Proctor at points fully half a mile apart. — Willard W. Eggleston, Rutland, Vermont.

AN UNUSUAL FORM OF DROSERA INTERMEDIA, VAR AMERICANA.

J. R. Churchill.

(Plate 15, fig. 8.)

Along the northern shore of Ponkapog Pond, in Canton and Randolph, Massachusetts, stretches an extensive bog. Almost inaccessible from the land side, towards the pond it becomes muddy, rotten, and partially submerged, indeed, a veritable morass. I have approached it by boat, and, under favorable conditions, have occasionally ventured upon it to collect the aquatic and amphibious plants which find a congenial home in such a place. Scheuchzeria is very abundant, and I have never happened to find the pretty Mud Sedge (*Carex limosa*, L.) at any other station near Boston. There are Pitcher-plants, Utricularias and Sundews, of course; but a little colony of long-

leaved Sundews (*Drosera intermedia* Hayne, var. *Americana*, DC.), which I collected here on July 4, 1898, were behaving in such unusual fashion that it seems proper to record it.

Our Sundews are all "stemless" plants, so called; that is to say, the leaves are all tufted at the base of the flower-stock in a rosette upon the ground. When, however, this long-leaved species gets into deep water, it gets out by raising this basal rosette of leaves, and the flower-stalk, "on its prolonged caudex" (Gray, Manual, 6th ed. p. 178), the "rootstock" (not the stem), "is elongated two to four inches when growing in water" (Britt. & Brown, Ill. Flora, II, p. 161). And we often find such specimens with the tuft of root-leaves many inches from the ground, after the water has perhaps subsided. Now, these long-leaved Sundews at Ponkapog were growing upon a floating mud-bank, and, though but little submerged, they were getting up, not at all by the elongation of the rootstock, as prescribed, but by the elongation of the stem proper, thus transforming our stemless Drosera into a long-stemmed plant with scattered leaves. The leaves were no longer tufted at the base, but by the lengthening of the internodes were now disposed separately along the stem.

This is so well shown by the figure which Mr. Faxon has kindly drawn that little further description is needed. The plants were from six to ten inches high, not more than two inches below the water, and branched from the base. There were no traces of flowers or fruit; the unusual development of stem and leaf had apparently exhausted the plant and rendered it sterile.

The significance of this unusual development remains in doubt. Some exotic members of this family are caulescent. Is this a reversion to an ancient type, which is so often suggested or indicated by such abnormal growths? Or are these individuals the forerunners or advance guard in their species, progressing through evolution and natural selection towards a superior and more advantageous form, to which their related species have long ago attained? — J. R. CHURCHILL, Boston.

EXPLANATION OF PLATE 15, fig 8. Caulescent form of *Drosera intermedia*, var. *Americana*.

RUSSULA EMETICA IN VERMONT. — *Russula emetica* Fr. has been frequently reported for the United States, but, until last October, I had failed to collect specimens clearly referable to it. Its close relative

Russula fragilis (Pers.) Fr. has been found from time to time, but always of small size and with the lamellae too crowded to be regarded as *R. emetica*.

On October 14 last I collected *Russula emetica* in ample quantity in a sphagnum bog on Grand View Mt., Vt. The specimens were growing scattered about in sphagnum under the small trees and bushes which thinly cover the marginal portions of the bog. The habitat is so peculiar that, if characteristic, it may be of aid in locating this species elsewhere.

The specimens were as watery as an Hygrophorus when collected and very fragile: pileus 5–8 cm. diameter, viscid, depressed, margin at length somewhat sulcate, cuticle separable; flesh white, red beneath the cuticle, very acrid; stem white, softer within, firm at first; lamellae white, remaining white, subdistant, free or adnexed, equal, edge not eroded; spores white, echinulate. — E. A. Burt, Middlebury, Vermont.

Dr. Burt's note on Russula Emetica should receive attention from the many collectors of toadstools, who, without study of the inconspicuous differences which separate one member of the genus from another, are prone to apply the name of this particular species to any red Russula with an acrid taste — or at least to any that may at the same time be viscid, red, and acrid. So used, the name of *Russula emetica* commonly serves as a convenient designation for those specimens that in the process of sorting out such as are fit for eating are discarded on account of their taste. The real *Russula emetica* is doubtless known to few, though it is, after Amanita, perhaps the most frequently mentioned of noxious species.

As to its edible possibilities (and such possibilities nowadays seem to attract mycophagists even more keenly than established actualities) there is in the records much difference of opinion. Uncooked, however, acrid Russulas are certainly poisonous; yet there is good weight of evidence that they may be so treated as to be harmless.

Even the tasting process has its discomforts, if not its dangers, in the case of these acrid Russulas. Some years ago the writer was one of an active party that brought well-filled baskets out of the Holliston (Mass.) woods. During the drive to the railway station one of the ladies occupied herself in sorting her red-topped Russulas — in the approved way. Her basket was large and her collection ample, most of the specimens being of acrid sorts. By the time the station was reached

some dozens had been tasted and thrown away. Although no ill effects were felt immediately by the taster, beyond some discomfort in the tongue, it was not long before more serious trouble appeared in the shape of disturbances of the digestive system and other symptoms of irritant poisoning. For several days the ill effects were seriously felt, and a partial paralysis of the sense of taste, and a burry, or sand-papery feeling of the tongue lasted for some time longer. Such an experience may well be avoided by all who care to take warning. — H. W.

THE LOCAL FLORAS OF NEW ENGLAND (ADDENDA).

MARY A. DAY.

(*Concluded.*)

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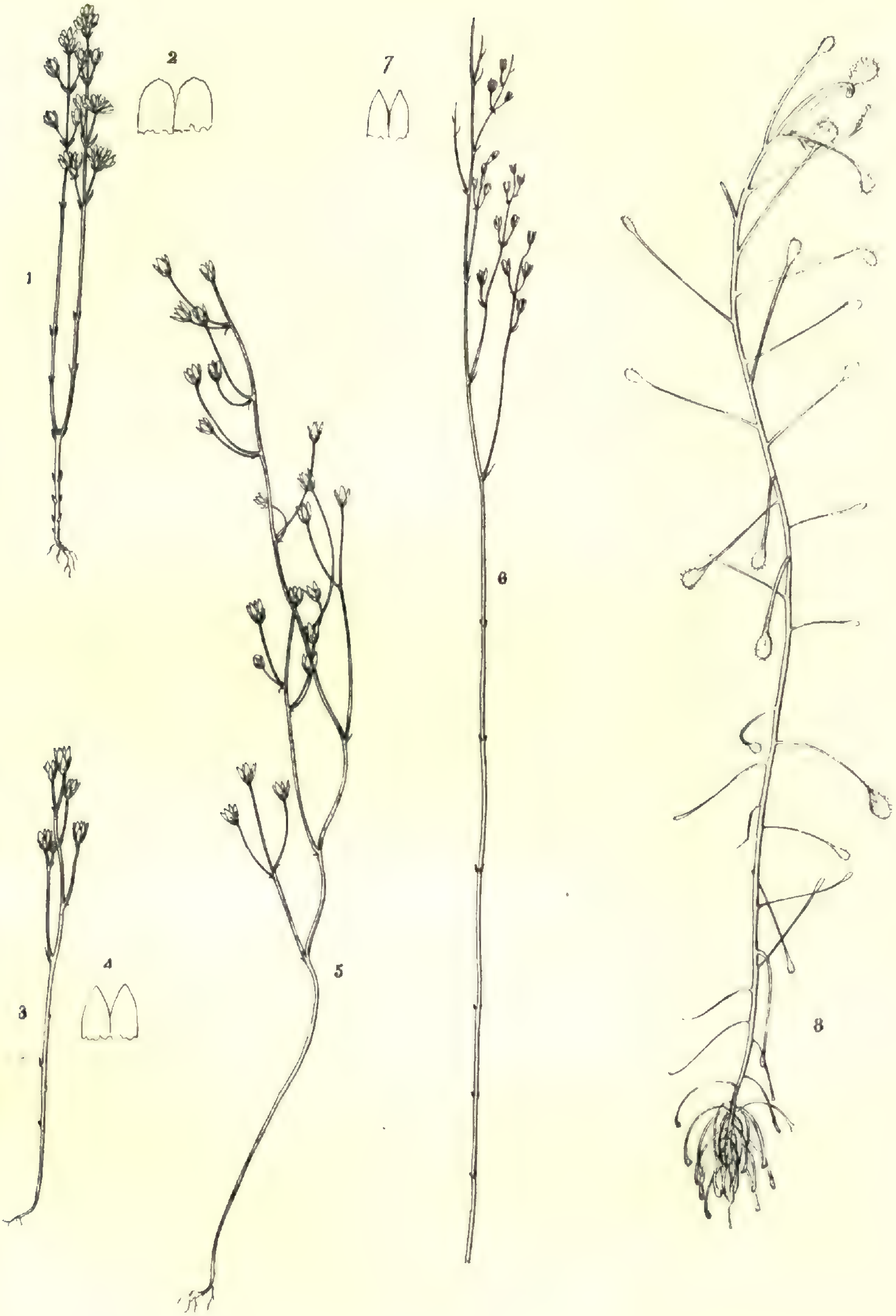

C. E. Faxon, del.

BARTONIA AND DROSERA.

Rhodora

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THE SLIME MOULDS.

THOMAS H. MACBRIDE.

(Plate 16.)

IN view of the many points of curious and biologic interest attaching to the Slime Moulds, it is remarkable that they have not been more widely collected and studied in this country. They are ubiquitous; they grow in field and forest, in orchard and garden, about every farm, nor less in every hamlet, in town and in city, in our hot-houses in winter, in our flower-beds in summer. In fact, wherever anything else can grow, especially anything of the mould or fungus kind, there slime moulds, at one time or another, are sure to be found. True, the smallness of their fructifications removes them somewhat from ordinary discovery, but some of them are large enough, and nearly all of them make up in the number of their sporangia what may be lacking in size, so that, on the whole, slime moulds are certainly not less conspicuous than other small forms of fungal life.

Besides, they possess in most of their species, in both color and structure, a certain curious elegance that makes them very attractive to every one who has the slightest sense of artistic delicacy and beauty.

But far beyond all this lies the interest attaching to these forms as living things. In their life-history they are unlike anything with which we elsewhere have to do. They are like moulds in that they use as food organic materials; they are unlike moulds in that they are destitute of hyphæ, and in their vegetative phase present simply a mass of slime, apparently without organization, without form, without structure of any kind; and yet living, moving, intact, cellular, multinuclear, and in growth and development evincing all the complexity of mitotic cell-division. They live as naked protoplasm, protoplasm in its "mineral

condition," if one might so say, creeping about on this worn old planet with all the freshness of Creation's youth. It is of course needless to mention here the interest attaching to protoplasm. This is the form of matter which everywhere fascinates the student of biology; the secret of life is with it. For the last twenty-five years, in all sorts of physiologic and biologic treatises, the tiny amœba has been made to play the leading rôle; but the plasmodium, that is, the vegetative, active phase of a slime mould, is worth a thousand amœbas; it exhibits vital phenomena on such a macroscopic scale. Contractility, irritability, assimilation, automatism, and all the other wondrous properties, so called, of living matter are here to be seen in their most beautiful display.

In our university laboratory a few weeks since, we had the plasmodium of a Tilmadoche (*T. polycephala* Schw.). To a piece of *Agaricus sapidus* the size of one's hand a little of the clear yellowish plasmodium was transferred, and the whole covered by a large bell-glass. The plasmodium increased rapidly in size, perceptibly so within an hour. In twenty-four hours, all over the walls of the bell-jar there were sheets and streams of protoplasm spreading and massing like an invading army in all directions, while the agaric melted before it. Fresh pieces of agaric were from time to time supplied, and were as rapidly consumed, until the plasmodium had increased to such dimensions that it completely lined the glass and hung down in streaming pillars and columns from the summit. The plasmodium was divided, and every one who chose made a culture for himself; the streams were induced to run and spread on slides, transferred to microscopes and so watched, as the currents oscillated to and fro; some parts were gathered on cover-glasses, stained and mounted to show the swarming nuclei. All the wonderful phenomena seemed susceptible of indefinite continuance; but unhappily cold weather came upon us; our supplies of fresh agaric failed. We softened up dry material of similar sort, but our slime mould, delicate connoisseur that it was, refused to be fed on food of our selection further, and presently succumbed to the assaults of a horde of real moulds and fungi that found our new supplies of pabulum quite suited to their less discriminating taste. The eater in turn was eaten. In the case of several bell-jars, however, we allowed the plasmodium to continue undisturbed its favorite food-supply and made no attempt at all to set forth a new menu. In these cases the net-work streamed about a

while, lost color, and finally everywhere transformed itself into a thousand tiny, sculptured, capitate sporangia, raised each upon a slender fibrous stem, each sporangium packed with abounding spores, in form and color characteristic of the species. Only in one particular were the spores abnormal; not a few were far too large. It would seem that in some cases the thin pellicle of cellulose which we call the cell-wall had enclosed, to form the spore, two nuclei instead of one as is the rule. Certainly the conditions of fruiting were, after all, not quite normal. Fruiting ensued before cell-division had had time in each case to become complete; hence the giant or double spores. Some of these spores, a few days later, were sown in water, placed in an incubating oven, where, in a few hours, they germinated by the simple breaking of the cell-wall, each giving rise to a tiny amœboid speck of protoplasm, motile, free. These, could they have found nutrition, would no doubt soon have greatly multiplied by simple cell-division, and gone on at length to form a new plasmodium like that with which we started.

Such was our experience in the laboratory, correspondent, no doubt, in all essential particulars to that which occurs out of doors in all appropriate seasons of the year, and such is the life-history of the slime mould generally.

But after all these were laboratory experiments, like nature, correspondent indeed, but still meagre and poor by comparison, as physiological laboratory experiments are pretty sure to be. To study slime moulds and know them we must go out of doors and be content to stay out of doors, for a day at a time sometimes. The laboratory may help us, to be sure, but the lack of it need not greatly hinder us. In moist and mossy woods, by perennial springs and streams these things are at their best. The Atlantic seaboard affords, therefore, the richest variety for this continent, the woods of Maine, and all New England, New Jersey, Pennsylvania, nor less the region farther south. Students in these localities have, accordingly, some advantages; they have profusion and variety.

In the latitude of New England the best time to begin these studies is perchance in June. The climate of Iowa, precipitation now aside, is perhaps not very different from that of Massachusetts. With us about the time the Mertensia shakes out its blossoms and the Polemonium is in fullest flower, on some fair day that breathes the earliest airs of summer, the student wandering in the woodland is sure to see, perhaps

flat on the surface of a log or stump, perhaps half-way up the bole of some oak tree, perhaps spread in golden profusion over some bed of leaves or even living moss, the forming fructification of *Fuligo*, a mass of yellow not unlike the broken yolk of an egg, sometimes tinged about the margin by shades of red and brown, but conspicuous, commanding attention alike by its color and its substance, now as two hundred years ago, when Marchand first described it about the tan-yards of Paris. This is at once the largest of the slime moulds and, with us, the earliest to form its fruit. In 1882, Sachs, in his celebrated lectures on the Physiology of Plants, tells of this species in language which will doubtless seem a wonder-story even yet to many readers; yet all that Sachs says of this species is strictly true. Schweinitz, who both in this country and in Europe, a hundred years ago, collected and named not a few slime moulds, but who really little understood their nature, tells of a specimen found by a blacksmith's forge (in South Carolina), in the morning, calmly fruiting on iron that had been red hot the night before! A century or two earlier, this had certainly been a portent or a prodigy. If our student is fortunate enough to find his specimen in its mucilaginous condition, having just concluded its migrations, he may leave it to be revisited, *Jove favente*, on the following day, when instead of slime he may expect to find a more or less hardened crust like stiffened foam, overlying a mass of sooty spores, dry and fine. This is the final fruit. A few days later the wind will have borne the spores away and only a thin whitish film may remain behind to mark the place of the singular transformation.

Fuligo is perhaps the first slime mould to be recognized by the beginner. If a student of fungi, especially if a collector of puff-balls, he has probably already made the acquaintance of the common *Lycogala epidendrum* (Buxb.) L. The plasmodium of this species is red, not a very deep red, but bright enough to attract attention; to the older writers suggestive of vermilion. This appears usually a little later in the year, say in July, August, and so through the fall.

Following closely on the maturing of *Fuligo*, or even contemporary with it, are to be found the plasmodia of many other species, less frequently observed because in general less conspicuous. They may be sought by rotting logs, around settled heaps of wind-driven leaves, in neglected corners of the garden. Here we may meet the pale venulose creeping threads of some of the *Didymia*, the richer yellows of the *Badhamia* species, the creamy nets of some of the Didermas,

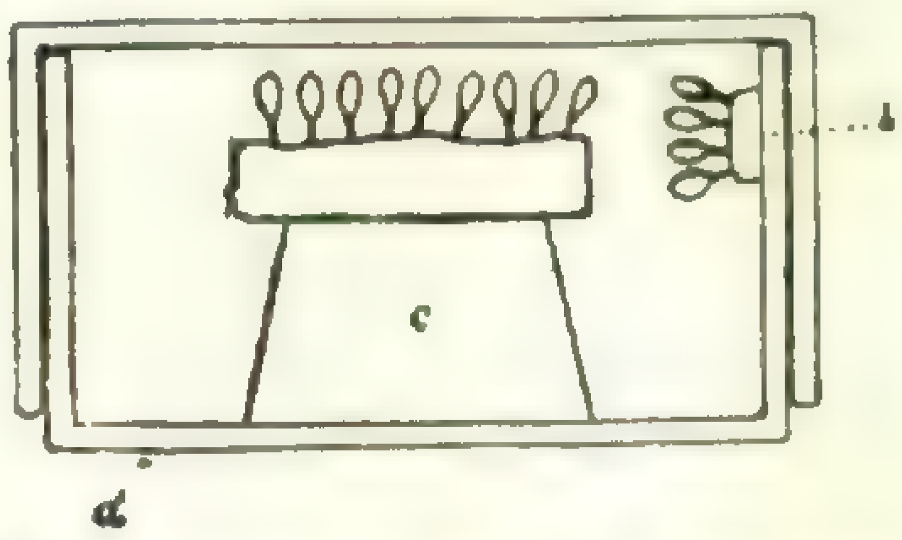
the snowy reticulations of *Diachea*. It must be understood in all cases that the color of the plasmodium in the same species varies with the progress of development, the food-supply and perhaps for other reasons to us unknown. The tints are not inherent, but are due to the presence of particles suspended in the protoplasmic stream. A plasmodium accordingly often loses its characteristic color as it passes into fruit.

Later in the season the plasmodia of the autumnal species begin to put in an appearance. The jelly-like whitish or greenish masses which later form our species of *Stemonitis* may be seen as early as July or August, but are most common in September. Probably not a linden tree falls to decay in our northern forests which does not bear at least one abundant crop of *Stemonitis*, certainly *S. maxima* Schw., and probably other species. The coniferous logs of Washington and Oregon, and doubtless of all our northern woods, bear quantities of *Stemonitis* in various species. *Comatricha* and *Dictydium* are common on logs of oak, while *Diderma floriforme* Bull. spreads its white or watery plasmodium inside oak stumps and forms its fruit in darkness, even sometimes in the ground. In the latter part of August and in September, the creamy plasmodium of *Mucilago* is everywhere in evidence, streaming amid piles of rotten leaves, climbing the living stems of herbaceous plants, there to hang in curious foamy masses of clustered fruit, an inch or two in length, unmistakable. The whole Trichiaceous series may now be sought, some with watery plasmodium rounding up in sporangia, white as ivory (*T. varia* Pers.), then dull yellow, ochraceous, orange; some with plasmodium scarlet, *T. decipiens* Pers., or rosy purple as *Arcyria denudata* L., or coral-red as *Hemitrichia vesparium* Batsch. In autumn too some of the most common Physarums are abroad with their plasmodia, on leaves, in wood-heaps everywhere, their fructifications on straw, on sticks, on every humble thing. Some species late in the year whiten, as if by frost, the earthward side of every fallen log, especially of aspen, linden, willow. Another autumnal form sure to be discovered is again one of the giant species, *Enteridium splendens* Morg. In some rocky damp ravine, on some barkless log, half rotten, we may discover a row of whitish or flesh-colored small cushion-like masses, perhaps a half a dozen of them. Another day we seek the place again; the cushions have changed to umber heaps covered with shining film, within like tiny sponges packed with spores.

To describe in detail the beauties of structure which the microscope reveals in the sporangia of these wonderful plants is beyond the scope of this paper. Some notion, however, of their variety and delicacy of form is given by the accompanying plate, which represents species of six of the forty and more generally known in the United States. All the species figured are found in New England, and one (*Comatricha cæspitosa* Sturgis) was first discovered there.

But it is proper now to offer a hint or two relative to the preservation and subsequent care of the materials we have gathered in wood and field. It is idle to collect the objects of natural history unless we may study them, and for satisfactory study they must be properly preserved. The care of the dainty forms we here discuss begins in the field. We should so carefully remove our material from its place of growth as not in the least to mar its pristine beauty. The collector should go armed with a stout knife, to cut away, if need be, a block of wood; he must carry a sufficient number of small boxes in which his finds may be stowed for safe transportation. Specimens, no doubt once good, often come in ruined by careless handling. If the specimen is to be of value it must be subject to no ill usage whatsoever.

Once we have our material at home it may be laid out on tables to dry, preparatory to mounting for the herbarium. Herbarium specimens are best cared for by mounting in small boxes, which may be selected of such size that a certain number will exactly fill a shallow covered tray, say one inch deep, and of the dimensions, outside, of standard herbarium-sheets. In these little boxes specimens may be so mounted as to be examined by the microscope with ease. A good method is shown by the accompanying figure. Here to the bottom of the box (*a*) is glued a bit of cork (*c*); on this is fastened by a drop of glue a bit of the material carrying the slime mould. This mount should be



just so high in the box that the sporangia will escape the lid when the box is closed. A smaller bit of material may be similarly attached to the box side (*b*) for examination by the microscope in this position. Nearly all the small-fruited forms repay study, simply as dark objects, under the low powers of the microscope. No tiny natural objects evince a more elegant symmetry of form, more delicate shadings of color than do these.

For more exact study we must prepare our materials for investiga-

tion under lenses of highest magnifying power. To this end various methods of manipulation have been suggested. For some species it is desirable to mount the sporangium on the slide dry, in natural condition. This is essential in studying the *Stemonitis* species and the Cribrarias. Blown-out specimens are to be selected. In ordinary cases, however, we must resort to other methods, methods which will bring to all parts their natural fullness and will also render them less opaque. For these purposes, for temporary mounting, a weak solution of potassic hydrate will be found serviceable, to be followed by glycerine, if the specimen is to be kept any length of time.

But of the various matters of microscopic technique it is perhaps less needful here to speak. It is rather sought here to win for a hitherto little-noticed, but certainly remarkable group of living things a wider place in the attention and regard of students. Of course, for the proper appreciation of these things we must be children of nature, lovers of the natural world and sympathetic with all that goes on there. The consolations, the delights of nature are not for those who label things, who spend time in a vain attempt to harmonize the rules of nomenclature; her rewards are for those who love to watch the consistent harmony of her deathless cycles, and who in the secrets of her humblest forms can read the stately march of her sublime ongoings.

University of Iowa.

Explanation of Plate 16.—Fig. 1, *Tilmadoche viridis* (Bull.) Sacc., a single sporangium magnified x 25; 1*a*, the same reversed; 1*b*, the same after spore-dispersal; 1*c*, Capillitium from a similar sporangium x 750. Fig. 2, *Craterium minutum* (Leers) Fr., sporangia with unusually long stalks, magnified. Fig. 3. *Comatricha cæspitosa* Sturgis, a cluster of sporangia x 4; 3*a*, the capillitium highly magnified; 3*b*, a single spore x 1600. Fig. 4, *Enteridium splendens* Morgan, æthalium (compound mass, imperfectly divided within into sporangia) natural size; 4 *a*, a spore x 1400; 4*b*, capillitium x 420. Fig. 5, *Cribraria aurantiaca* Schrad., sporangium containing spores x 30. Fig. 6, *Arcyria denudata* (Linn.) Sheld. Sporangia, two expanded, one still closed x 20; 6*a*, a part of the capillitium x 750.

A BLUE-FRUITED HUCKLEBERRY.

B. L. Robinson.

While collecting some plants on the eastern shores of Thorndike Pond at Jaffrey, N. H., in the late summer of 1896, I noticed two varieties of fruit on the huckleberry bushes (*Gaylussacia resinosa*). The berries on some bushes were, according to the laws laid down for

them in most descriptive manuals, black and glossy, while those on neighboring bushes were pale blue and dull, being covered with a glaucous bloom, quite in the manner of the true blueberries (*Vaccinium pennsylvanicum* and *V. corymbosum*), which were growing near and permitted easy comparison. The two varieties of huckleberry were not invariably distinct, for other individuals were found with bluish-black berries of an intermediate character. Several plants of each kind were examined in much detail to discover other differences correlated with the color variation, but only two points were found, namely the size and sweetness of the fruit which were both preceptibly greater in the blue than in the black-fruited form. Some days later Mr. Walter Deane and I revisited the spot and after together verifying the previous observations, marked certain individuals to be watched during the next season.

I inquired of several country people, especially berry-pickers, whether they knew a blue-berried huckleberry. Without exception they said they did and that they regarded the blue kind better than the common black sort. Naturally I questioned them closely to be sure they were not confusing the blue huckleberry with any species of Vaccinium.

On returning to Cambridge, I searched for Botanical references to the blue-berried variety and found the following in Emerson's Trees and Shrubs of Massachusetts, p. 399 of ed. 1, regarding the species in question.

"The common variety has black shining berries and leaves green on both surfaces.

A second variety has similar leaves and berries covered with a blackish or brownish bloom.

A third variety has somewhat glaucous leaves and berries covered with a glaucous bloom.

A fourth variety has larger berries of a bluish color with a bluish bloom, and very rich to the taste."

I cannot doubt that the fourth is the variety which would properly include the blue-fruited plants on Thorndike Pond.

The following season I revisited several times the marked plants and found with interest that the blue-berried individuals were precocious in their development, being a week or two in advance of the black-berried form, both in coming into leaf and in the time of flowering. No differences of flowers or leaves were observable. One exhibiting specimens of the different forms at a meeting of the New England

Botanical Club in 1897, I learned that several members were familiar with the blue-fruited variety. Mr. J. H. Sears has since placed at my disposal a suite of specimens and notes from eastern Massachusetts. He has made out several differences between the black and the blue-fruited sorts, such as abundance of resinous excretions in the inflorescence, color of the cortex, form of corolla, etc., but with my best endeavors I have been unable to follow these distinctions when examining specimens from a wider range.

Recently Dr. Charles B. Graves of New London, Connecticut, independently discovered the blue-berried huckleberry in his region, and was about to publish upon it, but learning that I had been observing the plant he most courteously placed his material at my disposal.

Mr. Emerson's varieties have suffered the quick oblivion which is apt to overtake unnamed forms, and even our best recent floras continue to describe the fruit of *Gaylussacia resinosa* as black, without a bloom. It seems desirable therefore to place the blue-berried variety on more definite record, as follows: —

Gaylussacia resinosa, var. **glaucocarpa.** Berries dull, blue, covered with a distinct pale sericeous bloom, and tending to be large and of rich flavor for the species: plant precocious in foliation and anthesis in comparison with the typical form. — Rocky shores of Thorndike Pond, Jaffrey, N. H., collected by the writer August 23, 1896, no. 58 (type, in herb. Gray), and subsequently in the same locality at various times by Messrs. W. Deane, E. L. Rand, and E. F. Williams.

Apparently identical plants have been found at Topsfield, Massachusetts, by Mr. J. H. Sears, who also states that its fruit is earlier and larger than in the typical form; North Berwick, Maine, by Mr. J. C. Parlin. No. 1,157b of the beautiful set of plants recently distributed from Biltmore, North Carolina, by Mr. C. D. Beadle, is (so far as the specimen in the Gray Herbarium is concerned) of this variety. Plants collected by Dr. C. B. Graves at Waterford, Conn., have smaller blue fruit and may possibly prove a different variety.

Gray Herbarium.

Carex Novae-Angliae in eastern Massachusetts — In the Gray Herbarium are two sheets of *Carex Novae-Angliae*, Schw., collected by William Boott, one of which is labelled, "Purgatory Swamp, Dedham, July 10, 1861," and the other "Blue Hills, June 3, 1870."

On the latter sheet, in Mr. Boott's handwriting, are the words, "This specimen is good *Novae Angliae*. The rest of this sheet seems to be *Emmonsii*. Did this specimen really come from the Blue Hills?"

It is evident from this label that Mr. Boott was himself in doubt whether the one specimen of *Novae Angliae* on this sheet had really been collected with the others, or had accidentally got in among them. Many of our local botanists have sought for *Carex Novae-Angliae*, both in Purgatory Swamp and in the Blue Hills, but without success, so far as I am aware.

On June 15, 1899, I found three very good specimens in one of the wooded valleys between Great Blue and Hancock Hill. I was particularly anxious to find *Carex Novae-Angliae*, and examined every one of the many tufts of *Carex varia* growing in the shade of the young oak and chestnut trees. Three plants were all I could find, after a careful search, and it is probable that it is not abundant, even in the localities where it grows. — Geo. G. Kennedy.

Capsella in January. — As an addition to our January flora, I should like to mention that I have several times this year observed the Shepherd's purse — *Capsella bursa-pastoris* — blossoming in Roxbury, the first observation being on January 6, and the latest on the 26th. It had a particularly favored situation, growing in the cracks of a sidewalk, and being protected by a stone wall which faced towards the south. The flowers did not open fully, but some of them, at least, have produced seed, of which, however, I have not yet tested the fertility. The ovaries appeared abnormally large. — John Murdoch, Jr.

Roxbury, Mass.

NOTES ON ECHINACEA.

M. L. Fernald.

A handsome purple cone-flower of the prairies has during the past decade crept gradually eastward: and now, like its near relative the yellow cone-flower (*Rudbeckia hirta*), is appearing in New England hayfields. Unlike the latter plant, however, the purple cone-flower has not yet become a troublesome weed, but is so far an unusual species in the northeastern states.

This is a tall (1 m. or less) showy plant with entire lanceolate harsh leaves and slender drooping 2-toothed pale-purple rays 4 to 7 cm. long, and it has been called in the standard floras *Echinacea angustifolia*, DC., or by Britton & Brown *Brauneria pallida*, Britton. As an indigenous plant it is found from Michigan and Illinois to Alabama and Texas, flowering in June and July, though, as stated, it is now becoming a weed by roadsides and in hay-fields in New England.

Another plant which has generally been associated with this tall species with long drooping rays, and which like it is labelled in most herbaria *Echinacea angustifolia*, is of broader range, generally growing only two or three decimeters high, and with 2-3-toothed rays much shorter (2 or 2.5 cm. long) and spreading, not drooping. This low harsh plant, with short spreading rays, is found from Tennessee to the Saskatchewan, Wyoming and Texas, and in different sections of its range it flowers from May (Texas) to August (Tennessee). In a recent paper, Mr. C. D. Beadle has described it as a new species, *Brauneria tennesseensis*.[1]

That Mr. Beadle has good grounds for dividing into two species the material which has passed as *Echinacea angustifolia* (*Brauneria pallida*) there seems no doubt. But that he, before launching as an undescribed species his *Brauneria tennesseensis*, or that Dr. Britton, before making the new combination *Brauneria pallida* and placing under it *Echinacea angustifolia*, could have examined with care the descriptions of the earlier species of the group, does not seem possible.

The first of these entire-leaved species was described from Arkansas by Nuttall as *Rudbeckia pallida*,[2] with "rays very long, dependent, bidentate, stem elongate, monocephalous," and in a note Nuttal adds "greatly resembling *R. purpurea* [*Echinacea purpurea*] . . . the peduncle, or part of the stem destitute of leaves, fourteen or sixteen inches long." From this description and note there is no hesitation in identifying with Nuttall's species the tall plant with long drooping rays, now becoming naturalized in the northeast. The species first described by Nuttall as *Rudbeckia pallida* was afterwards placed by him in *Echinacea* and should be known as *Echinacea pallida*, Nutt.

Only two years after Nuttall first described his species, De Candolle took up in the Prodromus Moench's genus *Echinacea*. *E. purpurea* was described with "ligules very long, dependent, the apex acute,

[1] Bot. Gaz. xxv. 359.

[2] Jour. Acad. Philad. vii. 77.

bidentate," and *E. serotina*, a plant now referred to *E. purpurea*, was described with "rays 2-3-dentate, spreading not dependent, shorter than in the preceding [*E. purpurea*]." Immediately following *E. serotina* he characterized *E. angustifolia*, from Texas, with "stem hispid, leaves all linear-lanceolate, hispid, entire, the radical subpetiolate, the cauline sessile . . . rays shorter than in the preceding, spreading." Now in view of the double comparison given by De Candolle, the rays of *E. serotina* shorter than in *E. purpurea*, and again those of *E. angustifolia* still shorter and spreading, we are hardly justified in placing with the latter species the tall plant (*Rudbeckia pallida*, Nutt.) with long drooping rays."

Yet in the "Botanical Club Check List" Dr. Britton, following earlier precedents of uniting as one species De Candolle's *Echinacea angustifolia* and Nuttall's *E. pallida*, took up for the two plants the earlier specific name *pallida* and made a new combination for them, *Brauneria pallida*, Britton. Later, in discussing his *B. tennesseensis*, Mr. Beadle interprets as true *B. pallida* the tall plant with long drooping rays. If by *Brauneria pallida* is meant *Rudbeckia* (*Echinacea*) *pallida*, Nutt., this interpretation seems justified. But it is not readily seen upon what grounds Mr. Beadle separates his *Brauneria tennesseensis* from the *Echinacea angustifolia* of De Candolle. The original description of the latter species agrees perfectly with the low hispid short-rayed plant already referred to as growing from Tennessee westward. The type of *E. angustifolia* came from near Austin, Texas, and we may take as representing that species in American herbaria, Mr. Heller's no. 1735 from Kerrville, about eighty miles southwest of Austin, a plant which perfectly matches De Candolle's description. A careful comparison fails to show any appreciable differences between this plant of Mr. Heller's and material of *Brauneria tennesseensis* collected by Mr. Beadle, and formerly by Dr. Gattinger at the original station near La Vergne, Tenn.

The marked characters and the synonymy of these two entire-leaved species, briefly stated, are

Echinacea pallida, Nutt. Tall 1 m. or less high: rays slender and drooping, 4 to 7 cm. long, 2-toothed at tip, pale or dark rose-purple. — Trans. Am. Phil. Soc. n.s. vii. 354. *E. sanguinea*, Nutt. l.c. *E. angustifolia*, Am. authors, in part. *Rudbeckia pallida*, Nutt. Jour. Acad. Philad. vii. 77. *Brauneria pallida*, Britton, Mem. Torr. Club, v. 333, in part. — Michigan and Illinois to Alabama and Texas. Sparingly introduced along roadsides and in fields in New England.

E. ANGUSTIFOLIA, DC. Low, 2 to 5 dm. high: rays short, 2 to 2.5 cm. long, spreading, 2-3-toothed, purplish to white. — Prodr. v. 554; and Am. authors in part. *Brauneria pallida*, Britton, l.c., at least as to synonym. *B. tennesseensis*, Beadle, Bot. Gaz. xxv. 359. — Tennessee to the Saskatchewan, Wyoming, and Texas.

GRAY HERBARIUM.

A PINK-FLOWERED FORM OF RUBUS TRIFLORUS. — In 1898, I found, growing near Farmington village, a number of specimens of *Rubus triflorus* with flowers which were almost a bright pink. At least a dozen of these plants were scattered along a roadside, and occupied a space two rods in length. The same pink form had been noticed in this place a year before, and with its colored petals strongly contrasted with the typical white-flowered plant, with which it grew. — H. W. JEWELL, Farmington, Me.

ERAGROSTIS FRANKII IN CONNECTICUT. — Mr. Hoffmann in RHODORA I, 230, records the occurrence of *Eragrostis Frankii*, Steud., in Berkshire County, Massachusetts, stating that it had not been previously reported north of New Jersey. It may be worth while to record an intermediate station at East Windsor, Connecticut, where I collected specimens in 1897. Some of these were deposited in the Herbarium of the New England Botanical Club, March, 1898. — C. H. BISSELL, Southington, Connecticut.

MINNESOTA PLANT LIFE,[1] by Prof. Conway MacMillan of the University of Minnesota, may be mentioned as a recent and attractively illustrated volume upon the habital and biological features of a vegetation not very unlike that of middle altitudes in the northern half of New England. In a commendable effort toward simple diction, not hitherto conspicuous in works from the same pen, technical words are scrupulously avoided. However, when in place of pretty generally known Latinized terms we find such expressions as "four-leaved water-fern," "fertile lobe of the adder's tongue fern leaf," "seed-rudiment-producing tree," the simplification seems a trifle labored.

[1] Report of the [Minnesota] Survey, Botanical Series iii. Large 8vo., xxv and 568 pages. St. Paul, 1899.

Notes on Vermont Plants.— In Rhodora **1**: 155, Mr. E. L. Rand notes the occurrence of *Subularia aquatica* on Mt. Desert Island. It may be of interest to know that this diminutive crucifer grows in great luxuriance in South Pond, Marlboro, Vermont, some ten miles from Brattleboro, at an estimated elevation of 1,000 to 1,500 feet above sea-level. My observations as to the depth at which it grows agree perfectly with those of Mr. Rand.

In Rhodora **1**: 172, Mr. H. W. Jewell reports the occurrence of *Vaccinium uliginosum* at an altitude of only 300 to 400 feet. I have collected it at about the same altitude on the banks of the Lamoille River in Johnson, Vermont. *Vaccinium caespitosum* is abundant, and fruits freely along the banks of the West River at Newfane, Vermont, not over 300 or 400 feet above sea-level. This locality is of easy access, as it is on rocks just south of the Newfane end of the bridge to Brookline. — A. J. Grout, Boys' High School, Brooklyn, N. Y.

The fifth annual winter meeting of the Vermont Botanical Club was held at the University of Vermont, January 26 and 27, 1900. Twenty or more papers of general and local interest were presented. An interesting discussion on the nature of species was led by Prof. F. A. Waugh and Dr. E. A. Burt. The former maintained that the more plant species were studied the more intergrading forms were found; and that species were created by man, not by nature. Dr. Burt, while admitting this often to be the case, held that there were certain well-defined gaps between species. Pres. Brainerd explained recent division of composite species, particularly in *Antennaria*.

The results of experiments upon the dehiscence of the Sporogonium of *Pteris cretica* were given by Miss Ethel Bates of Middlebury. She showed the dehiscence was due to variations in temperature rather than in moisture, as is commonly stated.

Prof. W. J. Morse, of Montpelier Seminary, led an interesting and profitable discussion of what should be included in the course in botany of the high school and academy.

Over one hundred new species of flowering plants were reported for the flora of Vermont by members of the club during the year. This, and other facts concerning the results of last year's work, were presented by W. W. Eggleston.

The officers of the club were reëlected, as follows: President, Ezra Brainerd; vice-president, C. G. Pringle; secretary and treasurer, L. R. Jones. — The midsummer meeting will be held at Willoughby Lake the second week of July. — C. D. Howe.

PRELIMINARY LISTS OF NEW ENGLAND PLANTS VI,—LEGUMINOSAE.[1]

J. R. CHURCHILL.

[The sign + indicates that an herbarium specimen has been seen; the sign — that a printed record has been found.]

	Me.	N. H.	Vt.	Mass.	R. I.	Conn.
Amphicarpa monoica, Nutt.	+	+	+	+	+	+
Apios tuberosa, Moench	+	+	+	+	+	+
Astragalus alpinus, L.	+	+	+			
" Canadensis, L.			+			
" Robbinsii, Oakes			+			
" Blakei, Eggleston	+	+	+			
Baptisia tinctoria, R. Br.	—		+	+	+	+
Cassia Chamaecrista, L.	—			+	+	+
" Marilandica, L.	—	+	+	+	+	+
" nictitans, L.	—		+	+	+	+
Coronilla varia, L.	+		+	+	—	+
Crotalaria sagittalis, L.	—		+	+	+	+
Cytisus scoparius, Link.				+		
Desmodium acuminatum, DC.	+	+	+	+	+	+
" Canadense, DC.	+	+	+	+	+	+
" canescens, DC.			—	+	+	+
" ciliare, DC.				+	+	+
" cuspidatum, T. & G.	—		+	+	—	+
" Dillenii, Darl.	+	+	+	+	+	+
" Marilandicum, F. Boott	—			+	+	+
" humifusum, Beck.				—	—	
" nudiflorum, DC.	+	+	+	+	+	+
" paniculatum, DC.	+	+	+	+	+	+
" rigidum, DC.				+	+	+
" rotundifolium, DC.	—		—	+	+	+
" sessilifolium, DC.				+	+	+
" strictum, DC.						—
Genista tinctoria, L.	+			+		
Hedysarum boreale, Nutt.	+		+			
Lathyrus maritimus, Big.	+	+	+	+	+	+
" ochroleucus, Hook.			+	—		
" palustris, L.	+	+	+	+	+	+
" " var. myrtifolius, Gray.	+		+	+		
" pratensis, L.	+			+		
Lespedeza angustifolia, Ell.				+		

[1] Printed in RHODORA as supplementary material.

	Me.	N. H.	Vt.	Mass.	R. I.	Conn.
Lespedeza capitata, Michx.	+	+	+	+	+	+
" intermedia, Britt.	+	+	+	+	+	+
" Nuttallii, Darl.				+	+	
" polystachya, Michx.	+		+	+	+	+
" procumbens, Michx.	—		—	+	+	+
" Stuvei, Nutt.				+	+	—
" violacea, L.	—		+	+	—	+
" reticulata, Pers.				+	+	+
Lupinus perennis, L.	—	+	+	+	+	+
Medicago Arabica, All. (*M. maculata*, Willd.)	+	—		+	+	
" hispida, Gaert. (*M. denticulata*, Willd.)	+	+	+	+	+	
" laciniata, All.	+			+		
" lupulina, L.	+	—	+	+	+	+
" sativa, L.	+	+	+	+	+	+
Melilotus alba, Lam.	+	+	+	+	+	+
" officinalis, Willd.	+	+	+	+	+	+
Oxytropis campestris, DC., var. Johannensis, Fernald	+					
Phaseolus perennis, Walt.						+
Robinia hispida, L.				+	+	+
" Pseudacacia, L.	+	+	+	+	+	+
" viscosa, Vent.	+	+	+	+		+
Strophostyles angulosa, Ell.	—			+	+	+
Tephrosia Virginiana, Pers.	—			+	+	+
Trifolium agrarium, L.	+	+	+	+	+	+
" arvense, L.	+	+	+	+	+	+
" hybridum, L.	+	+	+	+	+	+
" incarnatum, L.	+	+	+	+	+	+
" medium, L.	—			+	—	
" pratense, L.	+	+	+	+	+	+
" procumbens, L.	+	+	—	+	+	+
" dubium, Sibth. (*T. procumbens*, var. *minus*, Gray)				+		+
" repens, L.	+	+	+	+	+	+
Vicia Cracca, L.	+	+	+	+	+	+
" hirsuta, Koch.				+	+	—
" sativa, L.	+	+	+	+	+	+
" " var. angustifolia, Ser.		—	+	—	+	
" tetrasperma, Moench	+		+	+	—	+
" Caroliniana, Walt.	—					

NOTES UPON THE ABOVE LIST.

Amorpha fruticosa, L. (see RHODORA **1**: 164), and *Gleditschia triacanthos*, L., frequently collected along roadsides, etc., and reported as "escapes," are not well established as wild, but rank rather with the horse-chestnut (RHODORA **1**: 214), and some other trees, as merely plants of cultivation.

Amphicarpa Pitcheri, T. & G. There are specimens collected in eastern Massachusetts, in the herbarium of Mr. W. P. Rich, which cannot be distinguished from this species. See RHODORA **1**: 27. I have also seen, in the herbarium of Dr. E. H. Eames of Bridgeport, Conn., plants collected by him near that city, which are almost identical with the western species. Yet mature fruit from this station, which Dr. Eames kindly sent me, quite lacks the hairy valves so characteristic of *A. Pitcheri*. Without further material and study, it seems at least premature to include *A. Pitcheri* in our list as a New England plant.

Astragalus Blakei, Eggleston, Bot. Gazette, XX; 271, June, 1895 (*A. Robbinsii*, Oakes, var. *Jesupi*, Eggleston & Sheldon, Minn. Bot. Studies, XV, 155, June, 1894). Dr. B. L. Robinson has made a careful investigation of the validity of this species, with the result indicated in our list. I add here, also, his interesting notes as follows: "We have in New England, besides *A. alpinus* and *A. Canadensis*, two species of Astragalus, namely: 1–*A. Robbinsii*, Oakes, with small, light-colored flowers, and a rather short, flattish pod, which is shortly acuminate, has no dorsal sulcus, and exhibits only the minutest trace of a septum from the dorsal suture. This appears to be a local Vermont species. (Type specimen from Winooski River, Burlington. This station is now extinct.) 2–*A. Blakei*, Eggleston, with larger, more deeply-colored flowers, and longer, acuminate, triangular pods, with dorsal sulcus and a partial septum intruded from the dorsal suture. This species has also borne the names *A. Robbinsii*, var. *occidentalis*, Wats. and *A. occidentalis*, Jones. It is evidently like *A. alpinus*, a species of wide range, extending from Maine, through northern New Hampshire and Vermont, and to the far West."

Mr. W. W. Eggleston tells me that Perkins' report of *Desmodium canescens* in Vermont (based upon Robbins' plant from Pownal) is probably erroneous.

Two species of *Medicago*, not mentioned in the list, but reported in the Flora of Middlesex County, and based upon specimens now in the herbarium of the New England Botanical Club, were incorrectly de-

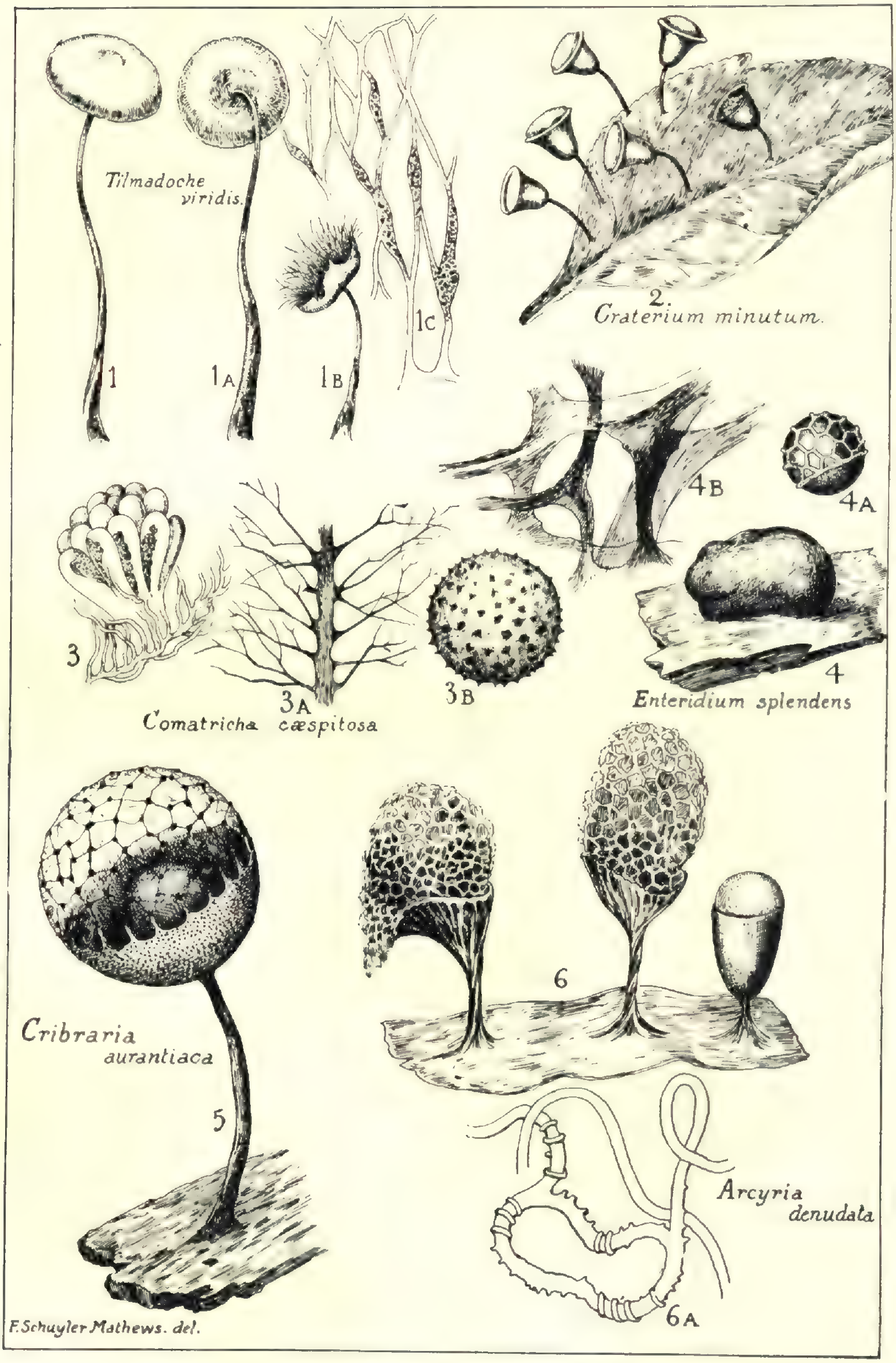
termined, and should be revised as follows: *M. aculeata* is *M. agrestis*, Ten., *M. lappacea* is *M. hispida*, Gaertn. var. *apiculata*, Urban. *Trigonella Cassia*, of the same flora, is *T. Nocana*, Boiss. There are other Medics which have crept into local lists, but they are mere waifs or ballast plants, and scarcely deserve mention. Plants equally ephemeral, sometimes collected from dumps, and reported in local floras, are *Lathyrus sativus*, L., *Phaseolus vulgaris*, L., *Pisum sativum*, L., *Lotus corniculatus*, L., *Scorpiurus subvillosus*, L., and others. They are transient relics of cultivation, rarely persistent, and are better omitted.

Regarding *Oxytropis campestris*, DC., see Rhodora **1**: 85.

Phaseolus perennis, Walt., is credited generally to New England in Gray's Manual and in the Illustrated Flora. It is mentioned as "not common" in Jackson's Flora of Worcester County (Mass.). After a thorough ransacking of our principal herbaria, and correspondence with Mr. Jackson and others, it seems clear that the report of its occurrence in Worcester County is without foundation; and that the record for New England rests at present solely on three specimens, all collected many years ago at New Haven, Conn. One of these sheets, in the Gray Hebarium, is without date, but it bears the stamp of the "Torrey & Gray Flora," and the label reads simply: "Phaseolus perennis, New Haven. Dana." In the Eaton Herbarium at New Haven is a specimen collected by A. B. Eaton at New Haven in 1859. The third sheet is in the Herbarium of Columbia College; and for the account of the ancient and fragmentary specimen thereon I am indebted to Mr. Roland M. Harper, student of botany in the University. The label reads as follows: "P. perennis. New Haven, Ct. recd. by Dr. Robbins from Shephard or Shorter. This is my only specimen. I should be glad to have you tell me if it is perennis & send it back when convenient." This sheet, too, bears the stamp, "Torrey Herbarium," but the label is neither signed nor dated. Dr. Britton, affirming the authenticity of the specimen, ventures the opinion that the label is in the handwriting of Oakes. Now will our New Haven botanists tell us where the station was and whether it is now extinct?

Trifolium stoloniferum, Muhl., is reported in Perkins' Catalogue of Vermont Plants, from Bellows Falls. President Brainerd writes that it is doubtless an error, or possibly a waif. No specimen is extant, and no recent collector has been able to find it there.

Vol. 2, No. 15, including pages 53 to 74 and plate 15, was issued March 6, 1900.



MYXOMYCETES

From "The North American Slime Moulds," by Thomas H. MacBride.
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Rhodora

JOURNAL OF

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THE BOSTON MYCOLOGICAL CLUB.

Jennie F. Conant.

Although the Boston Mycological Club has not the honor of being the first of its kind to be organized in this country, that distinction belonging to the Westfield Toadstool Club of Westfield, New York, yet it dates from the same year. In the summer of 1895, after numerous appeals had appeared in the papers for help in the study of fungi as food, a few gentlemen and one lady met at Horticultural Hall and agreed, after some deliberation, to form a club to be known as the Boston Mycological Club, with the following officers: President, Julius A. Palmer, Jr.; Vice-President, Wm. C. Bates; Secretary and Treasurer, Hollis Webster.

For a good many years previously experiments had been made by a few persistent American mycophagists, for example, by the Rev. M. A. Curtis, fifty years ago, and more recently by Captain Palmer and Professor Peck, to test the edibility of certain species recommended by Badham, Berkeley and other European writers, and also that of others not then in any list of edible kinds. Although the results of these experiments were made available by repeated publication, popular knowledge of the subject grew slowly, in spite of a deal of good-natured urging by these pioneers. That interest had, nevertheless, been aroused was shown by the welcome accorded in 1894 to articles by Dr. Farlow, Professor Peck and Mr. W. H. Gibson, which appeared in various periodicals in almost simultaneous response to the general demand for information. That at last the multitude were waiting only for guidance before eagerly joining in a fascinatingly dangerous pursuit has been further shown by the rapid increase in the membership of the Boston Club, from the little company that first met in August five

years ago to its present number of nearly five hundred, and also by the formation of similar societies in other parts of the country.

The aims of the Club, well set forth in the following extract from the constitution, are these: "To study edible mushrooms and toadstools and those noxious and poisonous kinds which might be mistaken for them, to collect and spread all valuable information concerning them, to arouse interest in mushrooms as food, and by exhibitions, lectures, and publications to make easy and certain the recognition of the few fungi that are poisonous and of the many that are edible."

Of the means toward these ends the exhibitions of fresh fungi are naturally the most important. On Saturdays, throughout the summer and autumn, fungi are brought to Horticultural Hall, where, through the courtesy of the Massachusetts Horticultural Society, they are placed on exhibition for the benefit of the public. The specimens are arranged by genera under cards on which generic characters are given, and, wherever possible, the specific names are also added together with information as to the quality as food. It is at the talks which follow these exhibitions, illustrated as they are by fresh material, that the most effective help is given. Special pains are taken to make all who attend these meetings acquainted, first of all, with the poisonous Amanitas, and to give emphasis to the fact that there is no short cut to the detection of poisonous forms, but that each individual specimen must be studied carefully and distinguished by characteristic marks. These demonstrations are so often repeated that those who attend the talks with any regularity can hardly escape instruction upon these vital points; and it is safe to say that, as a result of the Club's efforts, hundreds of people now possess and are spreading this essential knowledge which a few years ago was the property of a very few. Supplementary to the Saturday meetings are the excursions which occur at intervals through the summer, whenever the weather gives promise of a successful trip.

When the November frosts check the appearance of mushrooms in the fields and woods, methods of instruction are necessarily changed. Lantern slides, of which the Club has about three hundred, take the place of fresh plants to illustrate talks, which are given on the third Monday evening of each month from November to May in the lecture-room of the Boston Society of Natural History.

From time to time throughout the year bulletins have been issued, the earlier of these giving hints as to methods of collecting, advice as to books, and remarks upon various elementary matters, very helpful to

those who are ignorant not only of fungi but of other departments of botany as well. To make up in some slight degree for the lack of a comprehensive systematic work on mushrooms, synopses of various genera, with descriptions of the species most likely to be met with, are given in the more recent bulletins. It is to the bulletins that the Club owes its large membership in many cities of the South and West.

For the preservation of a record of the distribution of species, and for collecting other information of scientific value, an herbarium has been started, to which have already been added most of the more conspicuous fungi to be found in the neighborhood of Boston. It is the wish of a few of the more devoted and enthusiastic workers to make this herbarium of more general use to the Club members by placing it in a suitable room, in some part of Boston easily accessible, with some one in attendance to help in the identification of specimens.

For membership in the Club the only qualifications are an interest in mushrooms and the payment of one dollar each year.

The officers for the current year, which ends on April 30, are: President, George B. Fessenden; Vice-president, Wm. C. Bates; Recording Secretary and Treasurer, Miss Jennie F. Conant; Corresponding Secretary, Hollis Webster, P. O. Box 21, Cambridge, Mass.

SOME UNCOMMON MOSSES IN NORTHERN ESSEX COUNTY, MASSACHUSETTS.

J. W. Huntington.

Perhaps it might be interesting to the readers of Rhodora to know that quite a number of species of mosses considered very rare or unknown to the State of Massachusetts are found quite plentifully in the towns of Essex County, north of the Merrimac River, especially Amesbury. This town is a particularly good locality, from the fact that it has a diversity of habitat, and so is well adapted to the growth of many species. The centre of the town is, in fact, a swamp, which is undoubtedly of glacial origin, a well-defined moraine skirting its entire southern border, sometimes cutting across and making little bays of swamp land, which it is quite interesting to follow out and study. The borders of this swamp are somewhat depressed, while the centre is crowning, making a very noticeable difference in the distribution of certain species of mosses. For instance, *Hylocomium squarrosum*,

which is considered uncommon in the state, or indeed in New England, is here abundant, but it always grows about the same distance from the marginal ridge. It is provokingly sterile. I have hunted long for fruit, but always unsuccessfully. This swamp is the home of the *Dicrana;* at least, there are three that make it their home, *D. scoparium*, with its variety *pallidum*, and in various forms, *D. palustre* and *D. Bergeri*. The latter is abundant, but not always easily distinguished from *D. scoparium*, though the trained eye can see points of difference at a glance. On the shores one may find *D. undulatum, D. montanum*, and *D. Drummondi.*

While speaking of *Dicrana*, I will mention finding *D. viride.* It was on a small stone in a roadside wall. It was only a little patch, but, unlike the species elsewhere, it was abundantly fruited. Dr. R. H. True told me he thought there was more fruit on that little clump than in all the herbaria in Europe.

On the southern shore of Lake Attitash, a body of water in the western part of the town, is a wood of pine, extending, perhaps, a half mile, and on the bank, just over the water, for the whole distance, may be found a moss which, common enough in northern New England, is uncommon in Massachusetts, namely, *Pogonatum alpinum.* In this locality, *Webera sessilis* is very plentiful. In these pond regions there are deep depressions in which are pools of stagnant water. In these grow Button Bushes, which are covered with *Dichelyma capillaceum* and *Fontinalis Lescurii*, often in good fruit. In a similar locality in New Hampshire, just over the line, I find a very beautiful moss, with all the habits of *D. capillaceum* but clearly distinct from that species, or from *D. pallescens* or *Hypnum fluitans*, which it resembles. It is of a beautiful golden color, with a very long leaf, acutely serrate at the apex. I have referred it to *D. Swartzii*, though perhaps not correctly.

A swamp which I have explored this summer for the first time has yielded quite richly. The first visit I made to it I found very little of interest in the moss line, but later I found on the edge of the bogs, where the ground was free from sedge, a moss suggesting *Atrichum undulatum*, which on study proved to be *A. crispum*, sterile. In a later search I found a small patch of fertile plants, which were very interesting indeed. I also found a very pretty little Hypnum in the same habitat, that is, on the bare side of the bogs, hugging closely the sedge roots, mostly sterile, but sometimes nicely fruited. This dainty little moss proves to be *Plagiothecium latebricola.*

There are, no doubt, many more rare species about here, but we shall have to let time unfold them to us, as in this field the hunters are few, and the only one I know in this locality is a plain farmer, with no pretensions to scientific knowledge, but with an ardent love for the work, and for all things beautiful and wonderful.

Amesbury, Mass.

FLORA OF MT. MOOSILAUKE.

Willard W. Eggleston.

Mt. Moosilauke, New Hampshire, is an isolated peak southwest of the main ranges of the White Mountains and lying in Benton about nine miles west of North Woodstock. It is reached by a carriage road from Warren or by road and trail from both North Woodstock and Warren Summit. The trail from Warren Summit is the shortest approach from the railroad and the only one for which the writer can vouch. Moosilauke (with an altitude of 4,811 feet) is the highest peak in the region covered by Prof. H. G. Jesup's Catalogue of the plants within thirty miles of Hanover, New Hampshire, and has been visited by a number of botanists who have by this means added several species to the Jesup Flora. Thus the Rev. Joseph Blake is credited with having found on Moosilauke *Empetrum nigrum*, L., *Juncus trifidus*, L., *Luzula spicata*, Desv.[1]; Mr. W. F. Flint with *Arenaria Groenlandica*, Spreng., *Potentilla tridentata*, Ait.,[1] *Solidago Virgaurea alpina*, Bigel.,[1] *Vaccinium uliginosum*, L., *V. Vitis-Idaea*, L.; and the Rev. Arthur Fairbanks with *Loiseleuria procumbens*, Desv.[1]

I had long desired to visit this mountain and on the 26th of August, 1898, had an opportunity to do so, but under rather unfavorable circumstances. After a week of good weather at Mt. Washington I reached Warren Summit only to wait two days in the rain and then climb the mountain through a wet bushy trail and find the summit capped in fog, the thermometer falling and the wind almost a hurricane. That night the thermometer fell to 26° Fahrenheit and it did not rise above 34° the next day, — a temperature which with a strong gale does not permit very pleasant summer botanizing. However, I was rewarded for this discomfort by the most magnificent view I have ever seen. Whiteface in the Adirondacks, distant by air line 105 miles,

[1] No herbarium specimens known.

was plainly visible to the naked eye, while the White and the Green Mountains and in fact all elevations within a hundred miles stood up in fine relief.

When the fog had thus cleared and I was able to get a general idea of the mountain, I was disappointed to see so little good botanizing territory. I had expected much from a mountain 500 feet higher than Mansfield and 1,000 feet above Willoughby, but I found two essentials for a luxuriant growth of alpine plants, namely water and cliffs, largely wanting here. Moosilauke has two peaks over a mile apart, and both these summits as well as the ridge connecting them are free from trees. The highest peak, which was first explored, was covered with great masses of *Vaccinium Vitis-Idaea*, *Arenaria Groenlandica*, and *Juncus trifidus*. I saw some *Vaccinium uliginosum* and by the roadside just before reaching the hotel a single patch of *V. caespitosum*. Look as one would, no cliffs were to be seen and only one small bog off in the woods to the northwest.

At the hotel I was told of a ravine "Jobilldunk," and on visiting it found the best botanizing region of the mountain. I was surprised to find here *Arnica Chamissonis*, although in a depauperate form, also *Viola palustris*, *Scirpus caespitosum*, *Agrostis scabra montana*, and *Lycopodium Selago*. In the bog was *Empetrum nigrum* but a great "slide" on the west side of the mountain yielded nothing of interest.

The following plants collected about the peak have been deposited in the Jesup Herbarium of Dartmouth College, those marked with an asterisk being additions to Professor Jesup's Hanover Catalogue:

* *Viola palustris*, L.
Arenaria Groenlandica, Spreng.
* *Amelanchier oligocarpa*, Poem.
* *Pyrus sambucifolia*, Cham. & Schlecht.
* *Arnica Chamissonis*, Less.
* *Prenanthes trifoliata*, Cass.
* *Vaccinium caespitosum*, Michx.
" *uliginosum*, L.
" *Vitis-Idaea*, L.
Solidago macrophylla, Pursh.
Alnus viridis, DC.
Juncus trifidus, L.
* *Scirpus caespitosus*, L.
Agrostis scabra, Willd.

* *Agrostis scabra montana*, Tuckerm.
Calamagrostis Canadensis, Beauv.
* " *acuminata*, Gray.
* *Lycopodium annotinum pungens*, Spreng.
* " *Selago*, L.

One could not expect, in so short a time, to make more than a preliminary reconnaissance of the flora of the mountain, and this report of my collecting trip is written with a hope that it may form a starting point for further notes upon the flora of Moosilauke. Anyone finding unrecorded species upon the mountain should, if possible, send specimens of them to the herbarium at Dartmouth College, which most fully represents that interesting region.

Rutland, Vermont.

NOTES ON A SPECIES OF CYATHUS COMMON IN LAWNS AT MIDDLEBURY, VERMONT.

Florence M. Andrews.

(Plate 17.)

One species of Cyathus has been frequently found in Middlebury, growing on newly-seeded lawns. Without close examination of the specimens, they might be referred to *Cyathus vernicosus* (Bull.) De Cand., which is reported to be very common in the United States; but by careful examination and comparison with the excellent figures of *Cyathus vernicosus* in Tulasne's Monographie des Nidulariées[1] and with a fine set of European specimens of *Cyathus vernicosus* collected in Hungary by Dr. Hollos, which agree well with Tulasne's figures and descriptions, it seems evident that the Middlebury specimens are not *Cyathus vernicosus*. Instead they are *Cyathus Lesueurii* Tul., a species originally collected near New Orleans, of which the original description with full notes and careful figures is given in Tulasne's Monograph.

Apparently *Cyathus Lesueurii* has been but rarely found since its original discovery, as may be inferred from the few references which are given to it in literature. It was reported by Berkeley and Curtis in Notices North American Fungi as collected by Wright in Connecticut, and a collection from South Carolina was distributed by Ravenel in his F. Am. Exs. No. 474.

[1] Ann. d. Science. nat. 3d Serie (Bot.), 1844, pp. 81 and 79, Pl. 5.

The common name for any Cyathus is "Bird's Nest fungus" because of the resemblance to a diminutive bird's nest and eggs when one looks down upon the peridium containing the sporangiola. The peridium has a small elongated base and gradually increases in size toward the top (Fig. 5). While immature, it is closed at the top, but when the sporangiola are fully developed it opens by a deciduous lid called the epiphragm. The outer surface is covered with coarse fibers but the inner surface is smooth and shining. The sporangiola are disc-like in shape and are attached to the peridium by funiculi (Fig. 7). The wall of a sporangiolum is tough and composed of two layers joined together by interwoven hyphae which also extend into the layers (Fig. 3). The spores are borne on basidia to be found only in the interior of each sporangiolum.

A translation of Tulasne's original description of *Cyathus Lesueurii* is as follows:

Cyathus Lesueurii Tul. — "Peridium thin, membranaceous, gray becoming pale; the outside beset with scattered fibres, sometimes converging at their tips, or free of fibres; the inside of peridium glabrous; not striated or ciliated at the margin; with a very short limb immediately cut off, sometimes none; sporangiola discoid, dark, even, having a very tough and thick covering; hymenial layer thin, spores thick."

There are two forms described, the major and minor forms.

"Form major, — Peridium campanulate and with an elongated stipe, sporangiola and spores thicker: spores 28–32 μ. long by 22–24 μ. wide."

"Form minor, — Peridium subsessile, becoming white, with smaller sporangiola and spores. Spores 22 μ. long by 17–19 μ. wide."

The spores taken from the specimens found on the Middlebury College campus measured 29.6 x 25.9 μ.; while specimens taken from a lawn in the village had spores measuring 29.8 x 27.7 μ. (Fig. 1). These specimens from Middlebury agree well in general character with the description and are doubtless the major form of *Cyathus Lesueurii* Tul.

The spores of the *Lesueurii* from the South Carolina collection in Ravenel's F. Am. Exs. No. 474, I found to be of the same shape and to measure 26 x 22 μ.

Another species of Cyathus from the United States has been described, namely, *Cyathus stercoreus* (Schw.) De. Ton. which resembles in many respects *Cyathus Lesueurii* Tul. The description of *Cyathus stercoreus* given by Schweinitz is the following: —

NIDULARIA STERCOREA Schw. — " Peridia are obconical and somewhat scattered. Exterior of peridium strigose-hirsute, becoming canescent, finally bare and brown; margin fimbriate. Inner surface of peridium glabrous, not plicate-striate, reddish-chestnut, somewhat shining, becoming blackish toward the bottom. Sporangiola dark, smooth, somewhat large. Peridium one half the size of that of *Nidularia striata* with which it is allied."

I examined a section of the sporangiolum of *Cyathus stercoreus* made by Dr. Burt from the original collection in Herb. Schweinitz. The spores were the same shape but smaller than those of *C. Lesueurii*, measuring 15.8 x 18.7 μ (Fig. 2). This is perhaps the same as the minor form of *C. Lesueurii*.

I have studied specimens from several collections, referred to *Cyathus vernicosus* (Bull.) De Cand. The peridium of the *C. vernicosus* is more expanded at the top, and the outer surface is not covered with coarse fibres (Fig. 8). The spores are very much smaller than in *Cyathus Lesueurii*, obtuse at one end and pointed at the other (Fig. 4). In the specimen from Hungary the spores are 11 x 7 μ. In a specimen from Ravenel's F. Am. Exs. No. 473 and in one from Canada, the spores had the same shape and measurement.

A single collection of *C. vernicosus* has been made in Middebury, Vt. The specimens were growing abundantly and vigorously in a greenhouse, on soil taken from the garden. The spores were the right shape and had very nearly the same measurement as those from Hungary.

The wall of the sporangiolum of *C. vernicosus* and of *C. Lesueurii* (Fig. 3) measure about the same in thickness, but the wall of C *stercoreus* (Fig. 6) is much thicker.

In conclusion *Cyathus Lesueurii* (Fig. 5) may be readily distinguished from *Cyathus vernicosus* (Fig. 8) by the difference in shape of the peridia; by the coarse fibers which are present on the peridium of *C. Lesueurii*, and chiefly by the difference in shape and size of the spores. Both *C. Lesueurii* Tul. and *C. vernicosus* (Bull.) De Cand. can be distinguished from *Cyathus striatus* (Huds.) Hoffm., also found in this country, by the absence of the striated peridium.

MIDDLEBURY COLLEGE, MIDDLEBURY, VT.

EXPLANATION OF PLATE 17. — Fig. 1, spores of *Cyathus Lesueurii*, x 600; Fig. 2, spores of *Cyathus stercoreus*, x 600; Fig. 3, wall of sporangiolum of *C. Lesueurii*, x 100; Fig. 4, spores of *Cyathus vernicosus*, x 600; Fig. 5, peridium of *C. Lesueurii*, x 4; Fig. 6, wall of sporangiolum of *C. stercoreus*, x 100; Fig. 7, semi-peridium of *C. Lesueurii*, x 4; Fig. 8, peridium of *C. vernicosus*, x 3.7.

SOME VARIETIES OF POTAMOGETON AND SPIRAEA.

K. M. Wiegand.

According to Dr. Morong and other recent writers the typical form of *Potamogeton Nuttallii* should be small and slender with flattened stem, crowded distichous submersed leaves 2–7 inches in length by 1–3 lines in width, linear and 5-nerved. The floating leaves should be small (1.5– 3.5 inches long x 4–12 lines wide), 12–27-nerved, elliptical and sloping at the base into a short petiole. Most of our specimens from New England and westward agree very closely with this description except that the submersed leaves are often 7-nerved and never over 4.5 inches long.

My attention was recently called by Prof. W. W. Rowlee to some peculiar gigantic specimens collected by him in Oswego County, New York. Further investigation showed that this large form is frequent in ponds and streams throughout Central New York, and constitutes a quite well-marked variety. So far as known to me, it has heretofore been noticed only by Professor Dudley who, in the Cayuga Flora, says that "Only the specimens from Cayuta Lake have the small leaves as described by Robbins." The Cayuga Lake plants are thus recognized as larger.

The new form differs from the type in having a much longer stem, more distant submersed leaves, which are always very much larger and broader, and have from 9 to 13 nerves. When in the water they are also not so conspicuously distichous. The floating leaves are larger and more inclined to be obovate, and the mature fruit is noticeably larger. Possibly the extreme length of leaf in Dr. Morong's description was taken from specimens of this form. The following is a brief characterization of the variety.

P. Nuttallii Cham. & Schlecht. var **Cayugensis**. Large and stout, nearly a meter in length; stem somewhat flattened, internodes usually long (2–15 cm.); submersed leaves not conspicously distichous, very large (12–22 cm. x 5–10 mm.), evenly linear, acute or obtuse, 9–13-nerved, the space between the two inner nerves reticulated as in the type; floating leaves, several pairs separated by long internodes, larger than in the type (blade 5–6 cm. x 2–2.5 cm.), obovate oblong or elliptical, 30–40-nerved, rounded at the apex, tapering below into the broad petiole which is 3.5–4 cm. long; peduncles stout, achenes larger (3.5 mm. diam.); embryo spirally coiled.

Lakes and rivers of Central New York. It has been found in most of the ponds of Oswego County and in Cayuga Lake, as well as in other smaller lakes and streams about Ithaca.

While collecting last summer in the Adirondack Mountains my attention was called to the spiraeas of that region by the peculiar appearance of their foliage. Instead of the narrow dark-green and finely serrate leaves of the *S. salicifolia* found about Ithaca, the plants all possessed broadly elliptical and coarsely dentate leaves of a much paler or yellowish-green color. This color of the foliage was often quite marked as was also that of the flowers which on some plants was of a bright pink or rose-color. Closer inspection showed that the panicle, which in the ordinary form is densely tomentulose, was in these plants almost, if not quite, glabrous, but differences sought in the floral structures were not found and probably do not exist. A study of herbarium material leads me to the belief that *S. salicifolia* may be separated into two quite marked forms along the lines noted above. These may be distinguished somewhat as follows:

S. SALICIFOLIA L. Leaves broadly or narrowly oblanceolate, acute, dark-green, finely and sharply serrate; inflorescence broadly pyramidal, the branches, pedicels, and calyx densely tomentulose; flowers white.

Quite widely distributed over the north-eastern United States, our specimens coming from various portions of New York, Canada, and from as far south as North Carolina.

Var. LATIFOLIA Ait. Leaves obovate or elliptical, much broader and often shorter than in the last, scarcely acute, coarsely dentate-serrate, pale yellowish-green; inflorescence, broadly pyramidal, nearly glabrous, and with a yellowish tinge; flowers white or rose-color.

Also widely distributed in the same region, but seemingly more common in New England. I have seen specimens from Maine, Massachusetts, Connecticut, Virginia, and in New York State from Oswego County, Chemung County, and the Adirondacks.

I should be tempted to consider these forms distinct species if it were not for some peculiar specimens collected last fall near Ithaca, which seem to be rather intermediate in nature. More ample material may still prove them to be distinct. At any rate it must be admitted that in the extreme forms they are strikingly unlike.

It still remains an open question whether our white-flowered American plant is distinct from the European form with rose-colored flowers. Some European authors, among whom are Koch and Dippel, consider them distinct, and take up for the white-flowered form the name *S. alba*

of DuRoi. Dippel gives a good characterization of our present variety as *S. alba latifolia;* while Koch goes a step farther and considers them all three distinct species.

Cornell University.

Chlorocystis Cohnii on the Massachusetts Coast.—There was one genus omitted from Mr. Collins' valuable list of marine algae in the February Rhodora, which should be added in order to make it more complete. I refer to the grass-green unicellular alga, *Chlorocystis Cohnii* (Wright) Reinh., which was first collected by me in February, 1897, growing on Enteromorpha fronds, along the shore, at Lynn, Mass. This species, which is quite common throughout the year at the locality noted, has not been previously reported from this country, and has been only occasionally found abroad. Wright first discovered it off the coast of Ireland in 1877. Seven years later Lagerheim collected it on Swedish shores, and the following season Reinhard came across the plant while studying the flora of the Black Sea. Since then de Wildman secured specimens on the coast of France, and in 1894 Rosenvinge reported it from Greenland. All of these observers found the plant growing endophytically on various marine algae; but the material from Lynn showed *Chlorocystis Cohnii* to be epiphytic in its habit quite as often as endophytic. Thus far Enteromorpha is the only host for America.—G. T. Moore, Dartmouth College.

VARIATIONS OF ILEX VERTICILLATA.

B. L. Robinson.

Our common black alder has long been recognized as a polymorphous species, and attempts have from time to time been made to distinguish and characterize its varieties. These, so far as described, have been based chiefly upon the size, shape, texture, and pubescence of the leaves, features which show too much tendency toward independent variation to yield very satisfactory combinations of characters. Nevertheless, of these varieties the following forms (including the typical one), which were clearly recognized, although not fully published by Torrey & Gray, are sufficiently characteristic to merit a place in descriptive floras. It will be seen from the notes below that two

of the varieties (*padifolia* and *cyclophylla*) have been confused by recent writers, and a third (*tenuifolia*) should have a different authority from the one usually cited.

I. VERTICILLATA, Gray. Leaves oblanceolate to obovate-oblong, acuminate, dark green and nearly or quite glabrous above, finely pubescent, chiefly upon the midnerve and veins beneath, thickish and of firm texture, 3 to 7 (rarely 9) cm. long, scattered upon the branches, in a dried state opaque or nearly so, except along the smaller veins; the larger veins and midnerve usually impressed above.—Manual, ed. 2, p. 264 (1856). *Prinos verticillatus*, L. Spec. i. 330.—Common and generally distributed in New England; by no means confined to "swamps," the habitat assigned to the species by Britton and Brown.

Var. TENUIFOLIA, Watson. Leaves of the same general although rather variable size and contour as in the typical form, but thinner and more flaccid, membranaceous, lighter green, in a dried state pellucid punctate, the veins not impressed above, the pubescence scanty.—Bibliog. Ind. 160 (1878), where the combination is erroneously ascribed to Torrey, who employed *tenuifolia*, not under *Ilex verticillata*, but under *Prinos verticillatus*, Fl. N. U. S. 338 (1824).—Less frequent than the typical form, yet not rare. From New England I have to date seen specimens from the following localities: MAINE, Bangor (*Oakes*,) Stillwater, Penobscot County (*Fernald*), Somesville, Mt. Desert Island (*Fernald*); MASSACHUSETTS Oak Island (*Young*); RHODE ISLAND, north of Cat Swamp, Providence (*Collins*); CONNECTICUT, in not very characteristic form from Southington (*Andrews*, *Bissell*).

Var. **cyclophylla.** Leaves small, broadly obovate or suborbicular 2 to 2.5 cm. long, 1.5 to 2 cm. broad, rugulose above, paler and puberulent upon the principal veins beneath, clustered near the ends of the branchlets.—*Ilex verticillata*, var *padifolia*, Britton, Bull., Torr. Club, xviii. 314; Trelease, Syn. Fl. i. pt. 1, 391, in part; Britton & Brown, Illustr. Fl. ii. 392; not Wats., nor *Prinos padifolius*, Willd.—Collected long ago in the neighborhood of Lake Erie, without more exact data. Type in herb. Gray; co-type in herb. New York Botanical Garden. Although this striking small-leaved form has been confidently referred to var. *padifolia* by Professor Britton, l. c., it is clear from Willdenow's excellent description, Enum. Hort. Berol. 394, as well as from an authentic fragment in herb.Gray, that his *Prinos padifolius* of Pennsylvania was a very different plant, with larger obovate-oblong leaves, velvety tomentose beneath. The name *padifolia*, as a varietal designation under *I. verticillata*, was first published by Watson (Bibliog. Ind. 160), its sole definition being the synonym *Prinos padifolius*, Willd. The variety thus rests exclusively upon the type and description of Willdenow's species. A form bearing small, roundish leaves and approaching var. *cyclophylla*, has been found in a ravine on Jordan Mountain, Mount Desert Island, Maine (*Rand*).

Var. PADIFOLIA, Watson. Leaves obovate-oblong, thickish, about as large as in the typical form, but densely tomentose beneath, not only upon the veins but upon the intermediate areas as well.—Bibliog. Ind. 160 (1878), where the combination is incorrectly ascribed to Torrey & Gray, who employed (in ms.) the name *padifolia*, not under *Ilex verticillata* but under *Prinos verticillatus*. *Prinos padifolius*, Willd. l. c. — Originally collected in eastern Pennsylvania. The nearest approach to the real variety which has been seen in recent collections is Heller & Halbach's No. 518 from McCall's Ferry, York County, Pennsylvania. I have not found any satisfactory match for this variety from the New England states.

Forma *chrysocarpa*. Fruit bright yellow. — Georgetown, Massachusetts, *Mrs. C. N. S. Horner* (specimen in herb. Gray).

GRAY HERBARIUM.

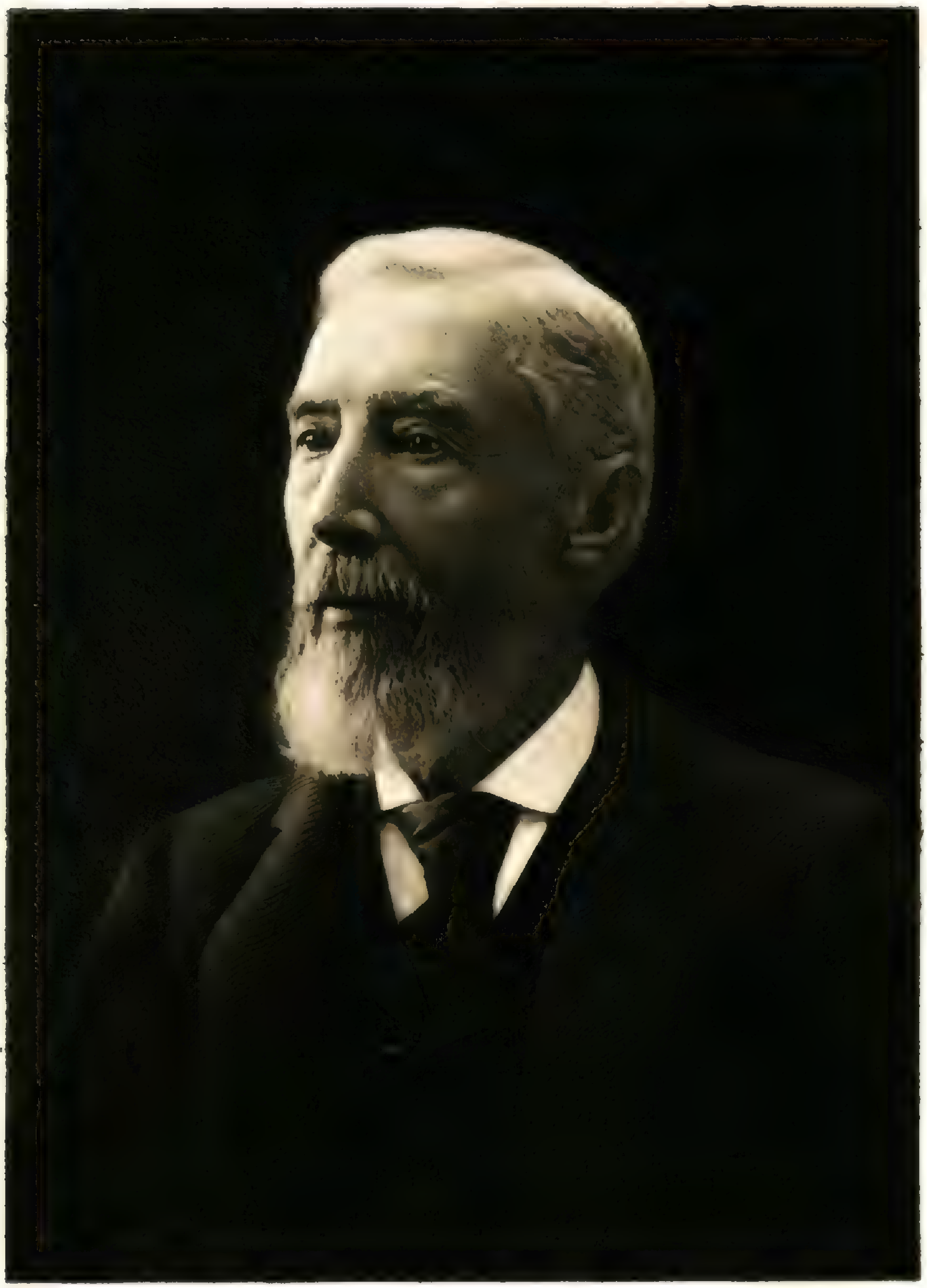
SCIRPUS SYLVATICUS: A CORRECTION. — In the January RHODORA (ii. 19) I stated that in "the fifth edition (1867) [of Gray's Manual] . . . the range of *Scirpus sylvaticus* was given as 'Base of the White Mountains, New Hampshire (*Oakes*), and northward.' . . . . In the sixth edition (1889) . . . the name *S. sylvaticus* was rightly applied." Mr. E. B. Harger kindly calls my attention to the fact that, in the later issues of the fifth edition, the southern *S. sylvaticus* was clearly distinguished from the northern *S. microcarpus (S. rubrotinctus)*. This change was made, in fact, in the second issue (1868) of that edition. Thus Dr. Gray, and not Dr. Britton, as stated in my recent article, was the first to separate in print the two species of the northeast. — M. L. FERNALD.

PEZIZA RAPULUM BULL., which Dr. Farlow tells me is not often collected, was found by Mr. E. L. Rand in Burlington, Mass., May 6. Only the chance inspection of the ground at the spot selected as a lunching place, brought to light the small cups of the fungus, 1-2 inch wide at most. Others were discovered by baring the earth, inch by inch, for the color of the cups was nearly that of the dead grass and leaves in and under which they lay. The slender stems, sunk an inch or two in the soil, each arose from an irregular, blackish sclerotium, about the size of a pea, or larger, as figured by Bulliard (Pl. 485 f. 3.) The sclerotia lay just below the turf. The spores are elliptical, 12 to 13 by 6 to 6½ μ; paraphyses few, inconspicuous, filiform.— HOLLIS WEBSTER.

Vol. 2, No. 16, including pages 75 to 92 and plate 16, was issued April 14, 1900.

F. M. Andrews, del.

SPECIES OF CYATHUS.



Sincerely Yours
Edwin Faxon

Rhodora

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EDWIN FAXON.

GEORGE G. KENNEDY.

(With portrait.)

The progress of botanical research in any region is seldom effected by the professional botanist alone. Every herbarium contains sheet after sheet of the rarest and most interesting plants from collectors whose names are associated rather with business or professional careers than with the publication of any botanical work. To such collectors, full of devotion and enthusiasm for their loved avocation, botanists owe a debt of gratitude for valuable assistance freely rendered in the solution of many a perplexing problem, and for the discovery of many an unrecognized and interesting plant. Surely these less-known investigators, often men of high attainments and rare powers of observation, deserve to be borne in remembrance, for their work may well serve as an inspiration and stimulus to faithful and unselfish study. Chief among such students of our New England flora was Edwin Faxon, whose death not long ago brought sincere sorrow to many a heart.

Edwin Faxon, son of Elisha and Hannah (Whiting) Faxon, was born in Abington, Massachusetts, September 16, 1823, and died in Willoughby, Vermont, June 12, 1898. He was of old New England stock, being a descendant in the eighth generation of Thomas Faxon, who came from England to Braintree before 1647. His early boyhood was passed in his native town, where, in the company of a much-loved relative who knew the wild flowers by name, he rambled in lane and meadow, acquiring there the interest in plants which was a source of so much pleasure to him in after years. There also, under private tuition, beginning at the early age of seven years, he laid the foundation of a sound knowledge of Greek and Latin. When a lad of thir-

teen, he removed with his parents to Boston, and entered the school of T. B. Hayward, where he continued his classical studies, and acquired proficiency in French and Italian. German was not much taught in those days, and it was characteristic of him that, later in life, when he found his ignorance of that language disadvantageous, he set to work to learn it, and obtained a good reading knowledge of it after he was fifty years old.

At the age of nineteen, he entered the office of his father, who was established as a leather merchant in Boston. In 1851 and 1852 he made a trip to Europe, spending nearly two years in travelling in the old-fashioned methods, largely on foot, through the Continent and Great Britain. This long journey appears to have satisfied his desire to see the world, for he seldom went out of New England again except on business errands; and in fact often made the statement when urged to visit other parts of the country, "New England is good enough for me."

On his return from Europe, he was admitted as partner in his father's business, and on the death of the latter in 1855, became the head of the firm. Throughout his active and successful business life he found time to indulge his taste for natural history, particularly botany, and his love for books and engravings, of which his knowledge was most thorough and accurate. When he retired from business, at the age of fifty-eight, he was well fitted, therefore, to enjoy the quiet pleasures that such tastes bring. He was never married, but made a quiet and congenial home in Jamaica Plain, happy in the society of younger brothers and sisters who shared his interests and pursuits. Here he brought together an interesting library and herbarium.

He now began to collect plants more seriously, and to explore and study the flora of New England. When Mr. Pringle began his career as a collector, the two were often together, and many were the interesting discoveries they made. With him he thoroughly explored all the ravines on the sides of Mt. Washington, and described their climb out of Tuckerman's Ravine up the wall to Bigelow's Lawn as the only foolish and dangerous adventure he ever had. After Mr. Pringle sought wider and fresher fields, Mr. Faxon still continued his explorations with indefatigable zeal, as many of our younger botanists whom he brought to their first acquaintance with our alpine flora can well attest. It is probable that no one, since Oakes and Tuckerman, has explored the White Mountains so carefully as he.

Mr. Faxon made his first trip to the White Mountains in 1843 by railroad to Portsmouth, N. H., thence on foot with a Boston friend, to Abel Crawford's house in the Notch. A party was made up for the summit of Mt. Washington, and with Tom Crawford as guide, he went over the path he was to know so well in later years. On arriving at the foot of the cone of Mt. Washington, a dense cloud gathered, but the two young men kept on to the top in the fog, while the rest of the party waited at the foot of Mt. Munroe. It gave him great satisfaction in after years to recall the fact that he had been at the summit of the mountain when only a stake in the rocks marked the top.

It was after 1875 that his regular collecting trips to the mountains began. In May or June of each year, he would visit the Crawford House before the hotel season began, and explore the woods and mountains. An account of one day's work will show his enthusiasm as a collector. In the last week of May he started to gather *Potentilla frigida* in flower in its alpine home. Up the steep path of Mt. Clinton, he found no difficulties till near the timber line, but there the soft snow was so deep he could scarcely wade through it. Emerging from the forest, he found the snow either blown off the rocks, or so hard he could walk with more freedom. Following the path to the foot of Mt. Munroe, he encountered a barrier in a precipitous snow slope, icy-frozen, extending from the top of Munroe to the bottom of Oakes' Gulf. Not daring to venture on this toboggan slide of two miles or more, he climbed the rocky summit of Munroe, and down the other side to the little plain by the ice-clad Lakes of the Clouds, and spent several hours exploring Bigelow's Lawn. He then returned by the same route to the Crawford House before nightfall. For many years, he never failed to visit the top of Mt. Washington, and of all the naturalists who collected there, he was the most constant and best known. His philosophical acquiescence in bad weather was the admiration of other less contented spirits, and he often reaped the advantage of this in the brilliant days that follow mountain storms.

With Mr. Pringle, also, he explored Mt. Mansfield, Vt., with its wonderful Smugglers' Notch, and shared with him the pleasure and glory of the interesting discoveries made there.

Mr. Faxon's most important contribution to American botany was the study and collecting of North American Sphagna. For several years previous to 1890, he had been much interested in the mosses of New England, and in 1899 sent his large collection of Sphagna to

Dr. Warnstorff in Neu-Ruppin, Germany. The value of the material was immediately recognized, and Warnstorff particularly states that his revision of the North American Sphagna was due principally to Mr. Faxon's sending him a systematic collection — about five hundred numbered specimens — of the Sphagna of Massachusetts and New Hampshire.

In 1890 the Botanical Gazette published Warnstorff's contributions to the knowledge of North American Sphagna, translated from the German by Edwin Faxon. In 1893 a prospectus of an intended distribution of sets of North American Sphagna was issued by Professor D. C. Eaton and Mr. Faxon. It was estimated that a full series might call for 130 different forms, but the sets as issued in 1896 comprised 172 numbers of very beautiful and carefully selected specimens, making an invaluable collection for the student of North American botany.

I well remember one day in the Alpine Garden of Mt. Washington when we had loaded ourselves with mosses and other plants, chiefly from the ice-cold brooks of that mountain plateau, a dreary fog settled down over the landscape, and we hastened to reach the carriage road before the rainy night set in. After an hour's climb over the rocks, we were in the road, and rested a bit before starting for the summit in the now increasing rain. Mr. Williams and I insisted on sharing Mr. Faxon's load, and were astonished beyond measure at the weight of wet sphagnum he was carrying (these loads were usually from thirty to forty pounds), and at the fact that he had been accustomed to just such burdens for many years in his botanical collecting. And then those pleasant evenings at the Summit House, Mr. Faxon always busy in laying out little bunches of wet sphagnum in his botanical papers, Mr. Williams and I constantly running into his room with a plant or a moss for question or identification, and he citing localities or incidents of his early mountain trips, when he with Mr. Pringle collected for the first time all the mountain rarities.

It is probable that no botanist had a better field knowledge of New England plants in certain areas than Mr. Faxon, in the years from 1872 to 1898. These areas were eastern Massachusetts; Mt. Desert, Maine; the White Mountains, New Hampshire; Smugglers' Notch, Willoughby, and the Lake Champlain shore in Vermont. He was constantly sending specimens from these districts to botanists all over the world, and was always glad to go at a moment's notice to any of these points for a particular plant for any applicant, even if personally un-

known to him. In this respect there was no one like him, and this trait of character won him the admiration and love of a wide circle of correspondents. The amount of his collecting may be known from the fact that after his death his duplicates, given to the Gray Herbarium, amounted to more than eleven thousand specimens of carefully classified plants. Mr. Faxon's first visit to Willoughby, Vermont, was in 1873, and for several summers he devoted himself to collecting the Willoughby flora. In the later years of his life he found much pleasure in the quiet beauty and delightful scenery of that unique mountain pass. It is less rude and rough than Smugglers' Notch, and all the peculiar plants are found within a mile or so of the house, while the birds that summer in the neighborhood comprise many of the rarer New England song birds. It was a treat to go with him on a June evening to the knoll overlooking the lake, and listen to the hermit thrush, while the sunset glow faded on the cliffs, and some stray warbler from the southward announced his summer arrival at Willoughby, to Mr. Faxon's great delight.

It was fitting that he should close his eyes suddenly and peacefully on this beautiful world in such a place, and on such a June evening, and leave to his friends the remembrance of a useful and happy life.

RHADINOCLADIA, A NEW GENUS OF BROWN ALGAE.

R. E. Schuh.

(Plate 18.)

The marine flora of our Atlantic coast, from New Jersey north, closely resembles that of the other side of the Atlantic, though probably not half so rich in species; the finding of a new species is therefore more of an event here than there, and when that species constitutes a new genus, it is quite an epoch. Within the past twenty years the only such genera have been Euglenopsis and Phaeosaccion, and the former of these has been now absorbed in the European Prasinocladus. While it is impossible to say what may not be swallowed up in some terrible "OK" list of the future, the form now to be described can hardly be included in any genus hitherto recognized by ordinarily sane algologists.

Its nearest connection is *Desmotrichum*, especially *D. Balticum;* but in that species the frond is unbranched though with plentiful hairs,

while in *Rhadinocladia*, as will be seen by the following description, the frond has an abundant ramification.

Rhadinocladia Farlowii, n. sp. Olive brown, growing in tufts, in which the individual fronds are plumose and 12–16 mm. high. Each frond is made up of a narrow, percurrent axis, with two series of cuboidal cells near the base, gradually increasing in number until four series are found at the center. This base is 40–50 μ wide and the central part 60–70. From the axis arise 30–50 flagellate branches, 6–8 mm. long, consisting of a single series of cells (rarely two or three side by side) about 25 μ wide, and ending in two or three long hairs; near the tip the branches may bear a few ramuli. The ramification is rather irregular as the branches commonly arise singly, but they are often opposite or in a cluster of three. Only the plurilocular sporangia are known, which are muriform, and arise from transformed branches. They are nearly or quite sessile, oblong or elliptical-oblong, bluntish, 20–25 μ wide, 70–85 μ long. Except near the base the whole plant is clothed with hyaline hairs, 1–2 mm. long, of 5–10 linear cells about 12 μ wide.

Growing on Chorda, and washed ashore at Vineyard Haven, Mass., August 27, 1892.

A slide of the type is deposited in the Cryptogamic Herbarium of Harvard University, and one at Columbia University. Later another will be placed in the National Herbarium.

The writer would also tender due acknowledgement to Mr. F. Schuyler Mathews for his great courtesy in making the beautiful and accurate drawings which are reproduced in the plate accompanying this note.

Bristol, R. I.

Explanation of Plate 18. *Rhadinocladia Farlowii.* Fig. 1. Terminal portion of the axis of a frond, showing general habit. Figs. 2 and 3. Portions of the same (more highly magnified) showing branches, hairs, and plurilocular sporangia in greater detail.

NOTE UPON A PROBABLE HYBRID OF ROSA CAROLINA L. AND ROSA NITIDA WILLD.

Francois Crépin.

In my note entitled *Nouvelles remarques sur les Roses americaines* (Bull. Soc Roy. botanique de Belgique, tome xxvii (1889), 2me partie, pp. 28 et. 29), I referred to a rose which I was inclined to consider a hybrid of *Rosa carolina* and *R. humilis*.

Now, I wish to call attention to another rose which may well be a hybrid of *Rosa carolina* and *R. nitida.* It was collected by Mr. George B. Fernald, at Foxcroft, Maine, in 1896, and Mr. M. L. Fernald has sent me several flowering specimens. The plant grows in company with or not far from *R. carolina* and *R. nitida.* I had at first considered this rose a variety of *R. carolina*, and had given it the name *setigera*, but a more recent examination has caused me to see in it a hybrid, *R. carolina* × *nitida.* It exhibits a mixture of the characters of its two probable ancestors. The stem is completely and densely setigerous with delicate prickles like those of *R. nitida;* and the lower and middle portions of the flowering branches are more or less setigerous, with here and there very small and delicate stipular prickles. The stipules are narrow and resemble closely those of *R. carolina*, but the inflorescences are usually one-flowered, the flowers resembling much more those of *R. nitida* than those of *R. carolina.* It ought to be added that the plant is taller and more vigorous than *R. nitida*, and that the middle leaves of the flowering branches are as often 9-foliolate as in that species.

With this rose from Foxcroft, Mr. M. L. Fernald sent me specimens of a rose, collected by him in 1896, at Lexington, Maine, which I have likewise considered as variety *setigera* of *Rosa carolina.* Although Mr. Fernald did not observe at Lexington *R. carolina* nor *R. nitida*, I am, nevertheless, inclined to believe that we have here also the product of crossing of those species. But the form from Lexington is nearer *R. carolina* than is that from Foxcroft. The stem is as densely setigerous, and most of the flowering branches are as finely prickly, but the stipular prickles are much stouter, resembling those of *R. carolina.* The inflorescences are more or less multiflorous, with flowers strongly suggesting those of *R. carolina*, while the leaves also approach nearer those of that species. The action of *R. carolina* might have been stronger in the plant from Lexington than in the form from Foxcroft.

Jardin Botanique de l'Etat, Bruxelles.

THE ORCHIDACEAE OF A SERIES OF SWAMPS IN SOUTHERN VERMONT.

A. LeRoy Andrews.

A deep cut in the Green Mountain range of southwestern Vermont furnishes an interesting study for the botanist. The floor of this little valley, which extends over a length of some six or eight miles from the vicinity of Pownal, is comparatively uniform in level and the drainage system is therefore sluggish and broken up for the most part into a series of ponds, swamps and bogs, presenting very diversified conditions of plant-growth. Springs of clear, cold water from the sides of the steeply overhanging mountains help to furnish the conditions so favorable to many members of the fastidious family of the *Orchidaceae.* A few facts gathered from a careful exploration of this region may be of interest to the student of the environment and distribution of our Orchids.

The representative species appearing uniformly throughout all the swamps is *Cypripedium spectabile.* Specimens of the pure white form of this species are frequently seen. A swamp of deep black mud, overgrown with trees of ordinary deciduous species, and traversed by cold streams furnishes also *C. pubescens* and gigantic specimens of *Habenaria hyperborea.* The occurrence of *Microstylis monophyllos* in this swamp is interesting as one of the more southerly stations of this plant in New England and from the fact that it has not been hitherto reported from this vicinity.

A wet meadow near by, also traversed by cold brooks, is in proper season empurpled and richly perfumed by abundant spikes of *Habenaria psycodes* interspersed with vigorous specimens of *H. lacera.* Here also occurs, as might be expected, what is very apparently a natural hybrid between these two species, of which I may speak more at length at some subsequent time. This same meadow furnishes a single dense clump of *H. virescens.*

A series of peat-bogs farther on, however, present the most interesting conditions and reward the botanist most richly. These bogs are mostly bare of trees, some of the firmer portions, however, being covered by a sparse growth of young tamaracks. Here in May or early June may be found quantities of *Arethusa bulbosa*, while later appear *Calopogon pulchellus* and *Pogonia ophioglossoides* in the greatest profusion, in charming contrast with the pure white, richly fragrant spikes

of *Habenaria dilatata*. Still later comes *Spiranthes Romanzoffiana*. The occurrence of this last species is especially noteworthy as being one of the extreme southern stations of this plant in New England, only a few miles from the Massachusetts line. In the higher portions of these swamps *Cypripedium acaule* grows abundantly.

Possibly a further examination of these places will yield one or two more species of Orchids. At any rate the locality is one of great interest not merely to the Orchidologist, but particularly to the student of the *Cyperaceae* and in fact to the plant-enthusiast generally.

CRITICAL NOTES ON THE NEW ENGLAND SPECIES OF LAMINARIA.

William Albert Setchell.

The species of the genus Laminaria have been much studied, especially on the western and northern shores of Europe, and much has been done to reduce the numerous and puzzling forms within certain and recognizable specific limits. While this has been fairly well accomplished for the European species, those of the rest of the world are still in need of more study in the laboratory and the field. Particularly is this true for the forms inhabiting the coast of New England, and the regions adjacent both to the North and to the South. De la Pylaie (1824 and 1829) and Harvey (1852) have given accounts of the species of this general region, and Farlow (1881) has revised, as far as possible, these older accounts, and incorporated the additional knowledge up to that time. Farlow states, however, that he must necessarily be content "with a superficial account of the perplexing forms of this exasperating genus," since he was unable to make use of the notes furnished him on the American forms by European correspondents. Since then, however, the Scandinavian algologists have worked over their species very carefully, and Foslie, in particular, has published (1884) a detailed and illustrated account of the Norwegian species. The writer intends to follow this account rather closely in the notes on the New England species given below.

The writer began his study of the *Laminariæ* in the fall of 1887, while a graduate student at Harvard University, the topic being suggested to him by Professor Farlow. From that time until the fall of 1895, this with other topics among the *Laminariaceæ*, continued to

interest him. Since the latter date, however, he has been unable to study the species in the field and it has seemed best to place before those who may have this opportunity, the results of this work, although incomplete, in the form of notes and suggestions. The papers of Farlow (1881) and Foslie (1884) will serve as a basis for the discussion of the New England forms, while frequent reference will be made to the articles of Guignard (1892) and various statements of Kjellman with regard to this group.

The species of the genus Laminaria are first divided into two groups by most writers, according to the character of the blade. In one section, the *Digitatæ*, the blade is more or less broad and split longitudinally into segments; while in the other section, the *Simplices*, the blade is proportionally narrow, and normally entire. These characters are usually very marked and there is little difficulty in the case of a perfect specimen, in deciding to which of these sections it belongs. Occasionally, a digitate form persists to the time of fruiting, with an undivided blade; but in such a case, the section is made clear by the breadth and shape of the blade. In other cases, the simple forms may be split longitudinally, but this does not obscure the relationship, since the specimen, if otherwise at all perfect, shows by the proportions of the blade, that it does not belong to the digitate section.

Within each of the two main groups, the species are divided under sub-groups, according to the presence or absence of mucilage ducts in stipe or blade, or both. While there are certain conflicting statements in regard to the constancy of these latter characters in certain given species, it seems probable that these arise from the imperfect character of the investigations hitherto made, and that when all the various species have been thoroughly and carefully investigated, these contradictory statements will disappear. More study of the fresh material is needed for this, and students of this genus on the coasts of New England may, by careful attention to this matter, help greatly. Certain species have mucilage ducts in the stipe and certain others do not, the same being true for the blade. The subgroups, then, are as follows: 1. Mucilage ducts present in both stipe and blade; 2. Mucilage ducts present in the blade but not in the stipe; 3. Mucilage ducts absent from both stipe and blade. The paper of Guignard (1892) should be consulted for details concerning the structure and course of the mucilage ducts, as well as for a resumé of the distribu-

tion of these structures in the various genera and species of the *Laminariaceæ*.

The final marks for distinguishing the species under each of these groups are varied, including arrangement of hapteres, character of stipe, shape of the base of the blade, presence or absence of an intramarginal series of alternate depressions and elevations, presence or absence of a ruffled margin, position, shape, etc., of the sori, the length of duration of the plant and the method of the renewing of the blade. That some of these characters are of little value for specific criteria, seems evident to the writer and a few words in regard to each of them may help toward a clearer understanding of these matters.

The arrangement of the hapteres, the branching outgrowths from the lower part of the stipe, fixing the plant to the substratum, varies very decidedly in the same species according to the particular habitat and substratum. The tendency toward a whorled arrangement is the normal one for all the species, but in many of them it is very much disturbed, and only makes its appearance under exceptionally favorable circumstances. The degree and regularity of the branching of the hapteres, too, is very variable and dependent upon the environment.

The character of the stipe often affords excellent means for distinguishing the species of one or other of the smaller groups. *L. longicruris* is readily to be distinguished from all other species by its hollow stipe; the stout and much flattened stipe of the forms of *L. digitata* serves to distinguish this species from others of the digitate section; and while the length of the stipe is variable in all the species, the proportions existing between the length of the stipe and the length of the blade are often a great help in distinguishing between the forms.

The shape of the blade, particularly of the basal portion, while often very variable in the same species, is yet a very satisfactory character in subdividing a species into its forms.

The ruffles along the edges of the blade of the species of the *Simplices* group, have been used, in connection with the rows of alternate elevations and depressions within the ruffles, in distinguishing species and more often in distinguishing between the different forms or varieties of the same species, but this is a very uncertain character, since, in some species, at any rate, the presence or absence of these characters depends on the season. In *L. Agardhii* and in *L. saccharina* of the

New England coast, the writer has found that the summer form is usually ample, with ruffles and rows of indentations fully developed; but in August a change takes place and this summer blade is replaced by a winter blade which is perfectly plane and devoid of both of these features. Again, in the spring, this plane blade is replaced by the ruffled and indented form, and it is possible, accordingly, to find at these seasons fronds which show blades of both kinds in varying proportions. This seems to be a sort of seasonal dimorphism.

The duration of the species of Laminaria has never been carefully investigated; it probably varies very much among the species of the genus. *L. longicruris* is credited with being an annual plant, while *L. saccharina* is biennial at least, and is probably perennial. *L. digitata* is certainly perennial and has rings in the lower portion of the stipe which are probably rings of growth. *L. stenophylla* and *L. intermedia* seem to be the annuals among our digitate *Laminariæ*, while *L. platymeris* is certainly perennial.

The perennial species all show the phenomenon of the renewing of the blade, due to a cessation of the growth during the latter part of the winter, the thickening of the tissues of the blade and usually the formation of sori. In the spring, the active intercalary growth is resumed by the inner tissues. The result is that the old thick, fruited blade is carried up on the summit of the new thin, as yet usually sterile blade, and the constriction between the two as well as the difference in texture between the two blades, makes this a very striking phenomenon in the majority of species. The digitate forms with mucilage glands in the stipe show the renewal in a much more striking fashion than do the digitate species without the ducts in the stipe, as Foslie (1884, pp. 26–28 and pl. 1, f. 1, pl. 3, f. 4, pl. 4, f. 1, pl. 5, f. 1, 2, pl. 10, f. 3–10), has shown. A similar difference exists in the cases of *L. digitata* and *L. platymeris* of the New England coast. In the perennial (or biennial?) form of the *Simplices* group, the renewing of the blade in the spring is equally pronounced, the plane thick blade of the winter being replaced by the thin, ample, ruffled, and indented blade of the spring and summer. In these forms, an almost equally pronounced renewing takes place in the early or later autumn, as mentioned above, when the thick, ruffled, indented and often fruited blade of the summer is replaced by the fairly thick plane blade of the early winter. The renewing at these seasons is found even in young specimens (cf. Foslie, loc. cit., pl. 10, f. 3-10).

Many cases of distortion of the species of Laminaria and of other species of the *Laminariaceæ*, are to be met with in any extensive collecting. Spiral forms both of blade and of stipe are often found, as well as the trilaminate forms, both of the digitate and of the simple species. Bifurcate forms are rarer, but do occur in the digitate species. They arise from the blade being split deeper than usual, that is even down through the transition place into the stipe, while the plant is still young and the tissues are still capable of a considerable amount of growth. These forms have even received varietal names from the earlier algologists.

(*To be continued.*)

NOTES ON THE DISTRIBUTION OF SOME OF THE RARER PLANTS OF CENTRAL MASSACHUSETTS.

Roland M. Harper.

During two seasons of botanizing in Worcester County and adjacent territory, I have met with quite a number of plants which, while already known to occur in the counties or states in which I collected them, are perhaps so local in their distribution that new stations for them may be of more or less interest to any one who makes a study of the geographical and altitudinal distribution of the flora of New England.

Most of these plants have hitherto been known in Worcester County from only one town, or have been reported by only one observer; and an examination of the more recent local floras of adjacent states and counties has shown me that they are, for the most part, little known in those regions also. I have therefore thought it worth while to place on record some of my observations on a few such plants for comparison with those of other botanists.

The lists of stations here given may be regarded rather as tending to fill lacunæ in our present knowledge of the distribution of the plants under consideration, than as furnishing actual extensions of range. All the plants mentioned have been collected in 1899 unless otherwise specified.

Botrychium matricariæfolium, Braun. Rich damp woods, Southbridge, August 13, 1898 (altitude 520 feet); only two or three specimens seen. This seems to be the southernmost known station for

this species in New England, as it has not been reported from Rhode Island or Connecticut.

Lycopodium inundatum, L. Sandy shore of Lead Mine Pond, Sturbridge, July 31, 1898; also in a wet sandy place in another part of the same town, August 28, 1898.

Isoetes echinospora, var. *Braunii*, Engelm. During last July and August I found this interesting and comparatively little-known plant in Worcester County in a number of stations and under a variety of conditions. I have seen it in muddy, sandy, and rocky bottoms of brooks and rivers, in Southbridge, Sturbridge, Dudley, and Brookfield, at altitudes ranging from 395 feet in the Quinebaug River in Dudley to 640 feet in Cohasse Brook in Southbridge. Some of the specimens observed grew above low-water mark, and were left high and dry by the natural subsidence of the water in dry weather. This plant has been previously reported in Worcester County only from Lake Quinsigamond, by Dr. Stone.

Sagittaria graminea, Mx. In muddy places or under water, Dudley, Southbridge, and Brookfield. I found the flowering, leaf-bearing form near the Quinebaug River in Dudley, July 30, but elsewhere I have seen only the submersed sterile form with phyllodia. On September 4, in company with Dr. Stone, I found this form on the sandy bottom of Quaboag Lake, about three feet below the surface. How the plant perpetuates itself in such a situation is an interesting question.

Panicum xanthophysum, Gray. Dry open woods, etc., Southbridge. This plant is also unknown in Rhode Island and Connecticut, and has been reported in Massachusetts only from Princeton and Framingham.

Oryzopsis asperifolia, Mx. In woods, Oxford, Southbridge, Sturbridge, and Brookfield. Previously known in Worcester County only on Mount Wachusett.

Oryzopsis melanocarpa, Muhl. Rocky woods, Sturbridge, July 23 (altitude 920 feet). Previously reported from Princeton.

Muhlenbergia Willdenovii, Trin. Rich woods, Dudley, August 27.

Muhlenbergia diffusa, Schreber. Dry fields, Southbridge, August 31.

Glyceria acutiflora, Torr. Muddy ditch in meadow, Southbridge, June 23 (altitude 660 feet).

Scirpus sylvaticus, L. Wet meadows, Southbridge, etc., not rare.

Eriophorum alpinum, L. Many fine specimens of this interesting plant, some of them 16 inches tall, were found in a sphagnous meadow in Dudley, June 11, at an altitude of only 675 feet, in latitude 42° 3′ 45″. This seems to be the southernmost known station for this species in North America, with the exception of one in Connecticut (Willington), which is about ten miles farther south.

Eriophorum vaginatum, L. Cedar swamp, Charlton, May 20 (altitude 640 feet); also near the summit of Mount Monadnock, N. H., July 3 (altitude about 3150 feet).

Eriophorum gracile, Koch (the type). Cool, wet meadows, Southbridge, Charlton, etc. In flower May 10, and fruiting the same month.

Carex fusca, All. Wet meadow near Quinebaug River, Dudley, June 11; Quaboag River marshes, Brookfield, June 18. The Brookfield specimens (which are referred by Mr. Fernald to this species) mature apparently about two weeks later than the others, and have the terminal spike entirely staminate.

Carex arctata, Boott. Rich woods on east side of Hatchet Hill, Southbridge, May 21; rare. This station is about a quarter of a mile from Connecticut, in which state (as well as in Rhode Island) the plant has not been reported.

Juncus Canadensis, var. *coarctatus*, Engelm. Wet woods, Southbridge, July 29 (altitude 600 feet); a very small form, with filiform stems (3 to 4 inches tall), and 1–4 few-flowered heads. This variety has been previously reported in the county only from Princeton, in which town I have collected it also.

Luzula vernalis, DC. Rich moist woods, Southbridge (altitude about 500 feet), rare. Previously reported from Mount Wachusett, where I have also found it, growing with *Panicum xanthophysum* and *Oryzopsis asperifolia*, at an altitude of about 1975 feet.

Goodyera repens, var. *ophioides*, Fernald. (*G. repens* of the Manual.) Rich coniferous woods, Southbridge (altitude 660 feet).

Corallorhiza innata, R. Br. Cool wet woods, Southbridge, May 14 and 20. Only two stations, with one or two plants at each (altitudes 640 and 500 feet).

Polygonella articulata, Meisn. Dry sandy soil along railroads, Dudley and Douglas, Mass., Thompson, Conn., and Burrillville, R. I., ascending to 590 feet in Douglas.

Liriodendron Tulipifera, L. On August 6 I found numerous young trees of this species in Burrillville, R. I., along the east side of Wallum Pond, in woods of apparently about five years' growth; and a little further search revealed a few similar specimens just across the line in Douglas, Mass., which is probably very near the northeastern limit of the species.

Ranunculus Pennsylvanicus, L.f. Wet clayey soil, Southbridge, July 29. Credited only to Barre in the Worcester County flora.

Adlumia cirrhosa, Raf. Shady, rocky woods, Southbridge, June 7.

Dentaria diphylla, L. Northeast side of Shumway Hill, Sturbridge, May 28.

Alyssum calycinum, L. Several specimens in Oak Ridge Cemetery, Southbridge, June 6; only in ground which had been recently turned up and raked over; accompanied by a few specimens of its relative, *Camelina sativa*, Crantz.

Dalibarda repens, L. "Gulf Woods," Southbridge (elevation 500 feet); quite abundant in certain spots.

Potentilla palustris, L. Marshes and muddy banks of the Quaboag River, Brookfield and West Brookfield, May 30 (altitude 610 feet); also near Quinebaug River, Sturbridge, July 23 (altitude 575 feet).

Poterium Canadense, L. Wet meadows, near Quaboag Lake and its tributaries, Brookfield and North Brookfield, June 18. No definite station is assigned to this plant in either edition of the Worcester County flora, but it seems to be very local in its distribution throughout New England. I have not seen it elsewhere in the county than in the valley of the Quaboag River.

Acer spicatum, Lam. Several fine specimens on the steep southwest bank of the Quinebaug River in Sturbridge (altitude 590 feet). Previously reported from Princeton, where it is more abundant. Both in Sturbridge and on Mount Wachusett it is accompanied by *Rubus odoratus*, L.

Viola rotundifolia, L. Damp shady woods, in two or three localities in Southbridge, at altitudes ranging from 540 to 600 feet.

Aralia quinquefolia, D. & P. Rich woods, Southbridge; about twenty specimens at one station.

Moneses grandiflora, Salisb. A few specimens found June 26, 1898, in rich woods near Hatchet Hill, Southbridge (altitude 800 feet).

Rhododendron viscosum, var. *glaucum*, Gray. Borders of cedar-

swamp, Charlton (altitude 640 feet); with the type, but easily distinguished by its pale leaves, contrasting with the bright green ones of the type. I have also noticed a marked difference between the variety and the type in the odor of the flowers. This variety seems to be known in New England from a very limited number of stations.

Kalmia glauca, Ait. Cedar-swamp, Charlton (altitude 640 feet).

Utricularia purpurea, Walt. Walker Pond (Lake Tantasque), Sturbridge, August 13 (altitude 595 feet).

Lonicera cærulea, L. Wet meadows in the southern parts of Southbridge and Sturbridge (altitudes 600 to 840 feet).

COLUMBIA UNIVERSITY.

ON THE FLORA OF CHESTERVILLE, MAINE.

C. H. KNOWLTON.

CHESTERVILLE is one of the southern towns of Franklin County, Maine. It affords a great variety of conditions for plant-life and is therefore a very interesting field of study. The northern part of the town has the ordinary hard-wood growth of the region. Near the center is a large sand-plain, known as Chesterville Plains. In the southern part is a "horseback" four miles in length, called Chesterville Ridge. This has a uniform elevation, and is very nearly straight. On each side of it are bogs and ponds.

It was my privilege, in company with Mr. H. W. Jewell of Farmington, Me., to explore partially this region, Aug. 15–17, 1899. We found the following plants, not previously reported from Franklin County, and all of them, with the exception of *Cladium*, from near the northern limit of their ranges.

Rhus venenata, DC. Margin of Horseshoe pond. A very rare plant north of York County.

Decodon verticillatus, Ell. Growing on a bog near the margin of Round pond.

Aster nemoralis, Ait. Bog near Locke's pond, N. Chesterville.

Utricularia resupinata, B. D. Greene. Very abundant on wet sandy shore, Norcross pond.

Fimbristylis autumnalis, R. & S. Same station, not abundant.

Cladium mariscoides, Torr. Same station.

Panicum xanthophysum, Gray. Abundant along the ridges.

Woodwardia Virginica, Smith. Very abundant on bog near Round pond.

Other plants of interest have been reported as follows, by Miss L. O. Eaton, of South Chesterville:

Lechea intermedia, Leggett. Roadside, on the Ridge, first reported by Miss Kate Furbish (1896). Its northernmost station in this section of the state.

Viola Selkirkii, Pursh. Abundant on a dry, sunny slope. Probably the southernmost station in Maine.

Cerastium avense, L. Sparingly in a field.

Vitis Labrusca, L. Roadside, one station. Rare so far north.

Rosa blanda, Ait. Rocky hillside.

Potentilla fruticosa, L. Sparingly on land recently used for a pasture. In Maine usually confined to river and lake shores.

Arctostaphylos Uva-ursi, Spreng. A large clump of these bushes on the Plains. Very rare in the interior of Maine.

Myosotis arvensis, Hoffm. In one place on the Ridge, in dry soil. Very local in the state.

Solanum nigrum, L. Growing rankly in a pasture grove. Practically its northern limit in Maine.

Polygonum hydropiperoides, Mx. Abundant in the Bog stream.

Pinus rigida, Mill. The pine of the Plains, which is perhaps its northernmost station in the state.

Pinus resinosa, Ait. The pine of the Ridge.

Corallorhiza odontorhiza, Nutt. Found in a swamp by Miss Florence Keyes. Its northern limit is at Farmington.

Arethusa bulbosa, L. Sparingly on a bog. Near its northern limit.

Habenaria virescens, Spreng. Found twice in old fields.

Habenaria dilatata, Gray. Abundant in an open swamp near the Plains. Rare southward in Maine.

Habenaria obtusata, Rich. Swamp near the Plains.

Habenaria blephariglottis, Torr. Plenty on bog near Locke's pond. Very rare north of Portland.

Allium tricoccum, Ait. By Little Norridgewock stream. The third station in the state.

Carex folliculata, L. In an old wood-road. Rare in the interior of Maine.

STATIONS FOR SOME OF THE LESS USUAL PLANTS OF CONNECTICUT.

E. B. Harger.

I wish to place on record the following station for the rarer plants of this region. Most of these, so far, I know, are hitherto unrecorded.

Nuphar minimum, Smith. Reynolds Bridge.

Sisymbrium Thaliaum, Gay. Oxford. Abundant in sandy fields near the Housatonic River.

Stellaria borealis, Bigel. Two stations in Oxford.

Geranium pusillum, Burm. f. New Haven.

Acer saccharinum, L. and *A. Negundo*, L. occur sparingly along the Housatonic in Oxford and Southbury.

Desmodium canescens, D.C. West bank of the Housatonic, four miles below Derby.

Cuphea viscossissima, Jacq. Oxford.

Epilobium palustre, L. Botsford's Station.

Gaura biennis, L. Frequent along the Housatonic in Oxford and Southbury.

Circaea alpina, L. Oxford and Reynolds Bridge.

Hydrocotyle umbellata, L. Banks of the Housatonic at Oxford, sparingly.

Viburnum cassinoides, L. Oxford and Middlebury.

Chrysopsis falcata, Ell. Milford Point.

Heliopsis scabra, Dunal. At two stations in Oxford, where it persists but does not increase.

Helianthus rigidus, Desf. and *H. grosse-serratus*, Martens. These two species are well established in an old field at Oxford. Probably both these and the preceding species were introduced with western grain.

Lactuca Scariola, L. New Haven.

Lobelia Dortmanna, L. Quassapaug Lake, Middlebury.

Andromeda polifolia, L. Litchfield.

Leucothoë racemosa, Gray. Huntington.

Kalmia glauca, Ait. In a bog called Cranberry Swamp. Woodbury.

Hottonia inflata, Ell. East Haven.

Onosmodium Virginianum, D.C. Abundant near the Housatonic in Southbury.

Cuscuta arvensis, Beyrich. Oxford and Southbury. Probably introduced with grass-seed.

Pentstemon laevigatus, Solander. This appears to be frequently introduced with grass-seed, when it persists until the original plants die, but does not seem to spread. Of four stations which I have known, three are extinct. At the fourth in Southbury it still grows.

Veronica Buxbaumii, Tenore. Oxford.

Utricularia intermedia, Hayne. Milford and Botsford Station.

U. purpurea, Walt. Quassapaug Lake, Middlebury.

U cornuta, Michx. Bethany and Woodbury.

Lycopus sessilifolius, Gray. Shore of Quassapaug Lake, Middlebury. This locality discovered by my father and myself in 1879 was the first station reported outside of New Jersey.

Blephilia ciliata, Raf. Beacon Falls.

Lophanthus scrophulariaefolius, Benth. Frequent along the Housatonic and Naugatuck Rivers. Especially common between Waterbury and Thomaston.

Chenopodium urbicum, L. Oxford.

Salicornia ambigua, Gray. Lighthouse Point, New Haven.

Betula papyrifera, Marshall. Frequent on the mountainous ridges along the Naugatuck River near Beacon Falls.

Populus heterophylla, L. East Haven.

P. monilifera, Ait. Common along the Housatonic and Naugatuck. Extends three to four miles from the river at Southbury.

Picea nigra, Link. There is an area of some five acres well covered with the black spruce in a swamp at Middlebury. Also a few small trees at Bethany.

Corallorhiza innata, R. Br. Oxford.

Spiranthes latifolia, Torr. Frequent on the banks of the Housatonic from below Derby through Oxford.

Habenaria blephariglottis, Torr. Bethany.

Streptopus roseus, Michx. Monroe.

Juncus nodosus, L. Banks of the Housatonic. Oxford.

Arisaema Dracontium, Schott. Oxford. Frequent along the Housatonic. Also at East Haven.

Sagittaria heterophylla, Pursh. Bank of the Housatonic. Seymour. Neither the Berzelius Catalogue nor Bishop give this species, but Prof. W. A. Setchell informs me that he has collected it in the state.

Scheuchzeria palustris, L. Bethany and Woodbury.

Potamogeton praelongus, Wulf. Twin Lakes, Branford.

Scirpus debilis, Pursh. Seymour.

Eriophorum vaginatum, L. Middlebury and Litchfield.

Rhynchospora fusca, Roem. and Schultes. Woodbury.

R. macrostachya, Torr. Woodbury.

Carex retrorsa, Schwein. West bank of the Housatonic River above Derby.

C. torta, Boott. Common about Oxford, although not in the catalogues.

C. granularis, Muhl. Oxford.

C. Willdenovii, Schkuhr. East Haven.

C. sparganioides, Muhl. Oxford and Reynolds Bridge.

C. Deweyana, Schwein. Reynolds Bridge.

Tripsacum dactyloides, L. East Haven.

Triodia cuprea, Jacq. Common along the Housatonic.

Eragrostis Frankii, Meyer. Common in sandy soil along the Housatonic at Oxford.

E Purshii, Schrader. Oxford.

Pellaea atropurpurea, Link. Twin Lakes, Branford.

Woodwardia angustifolia, Smith. Three stations in Oxford.

Phegopteris Dryopteris, Fée. Monroe.

Cystopteris bulbifera, Bernh. Oxford.

NAUCORIA CHRISTINAE.

H. Webster.

While visiting a familiar collecting ground along the northern edge of the Blue Hill Reservation, a few years ago, the writer came upon a small but conspicuous toadstool, fruiting in the loose soil formed of decaying chestnut leaves and burs. Its dark red color and sharply-pointed cap, together with its smooth and somewhat shining surface, gave it a markedly individual character, which became more strongly accentuated on further acquaintance. For, in addition to the striking peculiarities of color and shape, an attempt to collect the plant, which stood an inch or two high, disclosed a long stem, as in *Collybia radicata*, sunk in the leaf-mould to such a depth that several inches of soil had to be removed before a complete specimen could be obtained. The difficulty of collection was much increased, also,

by the extreme fragility of the stem, which, in spite of its comparatively large size, and evidently "cartilaginous" exterior, broke frequently of its own weight as soon as the upper portion was freed from its supports.

Examination showed the plant to be a Naucoria, closely related to the four Friesian species *N. lugubris*, *N. festiva*, *N. Christinae*, and *N. hilaris*, of which Fries observes (Hymenomycetes Europaei, p. 254.) that they form a remarkably distinct natural group. Dr. Farlow, to whom the fungus was submitted for determination, referred it to *N. Christinae*, with the information that it had not before been recorded for this country.

On account of some discrepancies between the plants found and the diagnosis as given by Fries, most of which, however, can probably be reconciled, the description and the main part of the remarks given in his Icones (vol. II., p. 20) are translated here in order that they may be compared with notes from fresh plants:

"Agaricus Christinae. — Pileus fleshy, thin, acutely conical, viscous, when moist bright cinnamon, when dry tawny, shining, growing pale; stipe fistulose, tough, deeply rooted, glabrous, dull blood-red; lamellae free, close, pallid, then bright saffron yellow.

"A most splendid fungus, with somewhat the stature of *Hygrophorus conicus*. Veil none. Stipe remarkably cartilaginous, very tough, unicolorous or paler above, at length bay, 3 to 4 inches long, 1 to 2 lines thick. Commonly with 4 to 6 elevated ridges radiating from the umbo; in wet weather sometimes strongly viscid, sometimes only moist, margin at first cracked, somewhat repand as if lobed; color varies blood-red, cinnamon, and rusty-red. Flesh thin, concolorous. Lamellae, free or slightly adnexed, receding, bare (not pulverulent), somewhat spotted. Spores ferruginous."

Though young specimens are acutely conical for a long time, the mature form is very broadly conical, with a sharp umbo; the surface is smooth, but marked (under a hand lens) with fine, close lines, which radiate from the apex of the umbo; the pileus is somewhat hygrophanous, the margin faintly striate when moist, and becoming revolute with age; the crowded lamellae appear to be free, but are always slightly adnexed, with an average breadth 2 to 3 times the thickness of the cap; their color varies from pale yellow to dark ferruginous; the stem is very fragile, but on wilting becomes tough, as described by Fries; it turns black on drying, as does the whole plant. The radicating portion is three or four times as long as the part above

ground; radiating ridges appear on the pileus in process of drying, and indeed it would almost seem as if some of the characteristics given by Fries, noticeably the toughness, the ridges, and the darker tints, had been drawn from plants that had partially dried either before or after collection. At any rate it has taken partly dry material to show the characteristics just noted.

The spores are somewhat pip-shaped, more strongly pointed at one end, and somewhat flatter on one side; size 10 to 11 x 5 μ. This agrees well with Quelet's "spores amygdaloid, 10 to 12 μ long," as quoted by Saccardo.

Saccardo, on what authority does not appear, gives the spores as being 4 to 5 by 3 to 4 μ, dimensions which accord with those of the spores of *Naucoria Jennyae* Karsten, as described in Hedwigia, 1881, p. 178, a species, from its description and the author's note, evidently very close to *N. Christinae*, but said to be larger, and with lighter-colored, ovoid spores.

Fries's figure (Icones, t. 121, f. 2) agrees fairly well.

After the first collection in 1896, the plant was found in the same year in damp, mixed woods south of Houghton's Pond, in the Reservation; in 1898, August, in the original station, also in Weston, Mass., in October, on the low river bank, under chestnuts and maples, and in Melrose, Mass., under oaks on a hillside. It has also been found in the Middlesex Fells, in Lynn woods, near Worcester (Dr. G. E. Francis), near Gilead, Maine (Miss Kate Furbish), and at Centre Ossipee, N. H. (F. O. Grover). Specimens of most of these collections are in the herbarium of the Boston Mycological Club.

It is most abundant in the Melrose station, where it was found in troops of several feet in extent, and in smaller groups, but not at all cespitose. The button stages have to be sought an inch or two below the surface, for they seem to arise from the lower layers of the humus, whence the base descends sometimes into the sandy soil below, and the stipe forces the pointed pileus up through the overlying leaf-mould to the surface. In places where the ground was covered with oak leaves, the stipes were longer, firmer, and flexuous, apparently having been forced by the non-resistant nature of the loose leaves to wind about in search of an opening through which they could reach light and air. At any rate, wherever the leaves were moist and firmly packed, holes were punched clean through by the straight upward thrust of the sharp-pointed buttons.

As the stem is very apt to decay an inch or so from its base, and thus increase its natural fragility, the difficulty of collection is great, and calculated to try the patience of any one who may happen upon this interesting fungus at the end of a day's trip, and try to get good herbarium specimens of it in his last ten minutes of disposable time.

SEAWEEDS IN WINTER.

F. S. Collins.

The greater part of the collecting of algae, as well as of higher plants, is done in the summer months, or at most in the period between the spring and autumn equinoxes, and it will probably surprise those who have not already investigated for themselves, to know that the life and growth along the shore are continuous. On land the lichenologist can always find employment, and the bryologist may find fruiting mosses during the winter months, but of other land plants one finds only the memory of the past or the hope of the future.

But not much below high-water mark the condition changes, and at low-water mark winter seems to have no influence whatever. On the first day of January last, I was at a point on the shore of Long Island Sound; the day was intensely cold, the thermometer hardly above zero. As the tide receded, a film of ice almost immediately covered the rocks and the fuci growing on them; every pool was covered with ice, but on breaking this coating, algae, red, brown and green, were growing in perfection, even the most delicate, filmy Ectocarpus. Before the pool could freeze solid, the tide would return and break the ice, and as long as they were not actually solidified, the plants experienced no inconvenience. Plants like the fuci can even endure some hours of actual congelation and being frozen so stiff that they are brittle, if the next tide releases them.

This hardiness enables the algae to extend to the waters well up towards the poles, and to thrive in places where the summer temperature of the water is only about 36 degrees Fahr. Some of the Laminariaceae have even been known to grow luxuriantly and produce fruit, zoospores, during months when the water was never above 28 degrees Fahr.

It must not be supposed, however, that the vegetation on our

coast is the same at all seasons. Algae, as well as higher plants, include annuals, biennials and perennials. Nearly all of the latter have their periods of rest and periods of activity, but not all at the same seasons; some are quiescent during the summer and autumn, beginning a new growth in the winter, and reaching the highest point in the spring, others just the opposite. Some of the Laminariaceae produce a delicate frond at one season of the year, a coarse and leathery one at another; between the periods of activity is a period of rest, so that the two forms are sharply marked off. As the point of growth is at the base of the blade, the old frond is pushed up by the new, and the remains of a delicate frond may be seen at the tip of a coarse one, or a coarse frond with a delicate one forming at its base.

Biennials are not common among algae, and not clearly understood; the great majority of species are annuals, but these annuals, like death, have all seasons for their own. Some, like Phyllitis, may be found at any month of the year; some, like Punctaria, only in spring; perhaps the largest number of annuals appears in spring and summer, when shallow bays are warmed by the sun, and swarm with life; in southern New England, with Dasya, Grinnellia, Agardhiella and others of our most characteristic forms; but there are many winter annuals, both on the northern and the southern coasts. Some of them, like Phaeosaccion, are short lived, found for a little over a month, then disappearing utterly; in March this plant produces incredible numbers of zoospores, minute cells each with its hour or two of active, seemingly voluntary motion, then sinking to rest; what happens then, how the species continues, no one knows, but the next February the delicate fronds are there again.

The genus Callithamnion, taking it in the older sense, not as divided up at present, is almost a calendar of the seasons, from *Antithamnion Americanum* in February in Long Island Sound, to *Callithamnion corymbosum* in Massachusetts Bay in November, while the little *Rhodochorton Rothii*, continuously vegetating, begins to fruit in December and continues until March.

Why one species selects one season and another another, why *Antithamnion Americanum* forms its wonderfully delicate and bright colored fronds before the waters begin to warm with spring, while its not distant cousin, *Griffithsia Bornetiana*, comes only with the midsummer days, we cannot even guess; there seems to be no generali-

zation that will cover these, and many similar cases. We can only observe, and hope that some time the facts will furnish the clue. And observing is a real pleasure, for those that have the time and the inclination. There are days in every winter month when the weather is mild, and a few hours at the shore on such days may show things never seen by summer visitors. It is hardly likely that picnic parties will be organized, to eat lunch on the rocks of Cape Ann or Marblehead, and gather "mosses"; but for one who has the opportunity, and a fairly robust constitution, winter collecting has a relish, which all who enjoy out-of-door exercise in cold weather will understand.

A new local flora. — Mr. Luman Andrews, of Southington, Connecticut, has just issued a "List of the Flowering Plants and higher Cryptogams growing upon the summit of Meriden Mountain, Connecticut." We learn from the introduction that Meriden Mountain is a trap dyke, with an altitude of 1,007 feet, being, in fact, the highest of its kind in the state. The part particularly investigated was the summit of the southern terminus, comprising about twenty acres. The list, without laying claim to completeness, contains 287 species and varieties. *Rosaceae*, *Compositae*, *Ericaceae*, *Cyperaceae*, *Gramineae*, and *Filices*, are well represented, while very few *Cruciferae*, *Caryophyllaceae* and *Leguminosae* have been found, which is by no means surprising in an exposed and rather sterile area. The list is obviously the result of much conscientious field work, in which specimens have been preserved in all cases admitting of doubt. A clear photographic print of the mountain accompanies the list.

The intensive study of the vegetation of a limited and, upon the whole, rather barren tract, although offering much that is profitable and fascinating, is not very frequent. It is to be hoped that others may follow Mr. Andrews' excellent example.

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RHADINOCLADIA FARLOWII, nov. gen.

Rhodora

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SOME JESUIT INFLUENCES UPON OUR NORTHEASTERN FLORA.[1]

M. L. Fernald.

THE canoeman who makes camp at night or lands for his mid-day meal by the St. John or the Restigouche must observe how different are the plants about him from those with which he is familiar at home. Even those who in town lay no claim to botanical knowledge are impressed by the large proportion of unfamiliar wild flowers; while, to those who concern themselves primarily with such matters, the vegetation of the upper St. John has been, since the return of its first botanical explorer, a constant source of problems. The scores of plants unknown elsewhere in New England are not alone, however, in furnishing puzzling questions for the student of botanical geography, for on the gravelly shores with these unique northern plants are seen in great profusion many species which, about our cities and towns, are every-day roadside weeds. A returning canoeman whose eyes are ever open to the vegetation about him has recently written: "One of the last plants that we saw on the borders of the Grand River settlement was the campion-flower (*Silene Cucubalus*). It was the first to attract our attention on the pebbly beaches of the Restigouche. It was almost constantly in sight on the whole course of the river. And yet it is not a native plant, but introduced on this continent from the Old World where it occupies wide areas from North Africa and India to the Arctic Ocean. It has evidently followed the footsteps of man, both as settler and explorer, for it is as abundant on the upper St. John as on the Restigouche."[2]

[1] Slightly modified from a paper read May, 1897, before the Natural History Society of New Brunswick.

[2] G. U. Hay; The Restigouche — with notes especially on its flora (Bull. Nat. Hist. Soc. N. B. xiv. 18).

As I have wandered along the gravelly beaches of the St. John and the Aroostook or have paddled through the calm lakes and whirling rapids of the St. Francis, this point has often set me wondering how to tell a really indigenous plant. For, wherever I have been on the St. John waters, the main St. John as far as the Little Black, or up the Aroostook and the St. Francis, the campion has always appeared in great masses, covering the gravel with its slender spreading gray-green stems and everywhere developing a wonderful profusion of white flowers tipped by purple anthers. Such stretches of airy white are among the most attractive features of these shores, for here the campion has lost the weedy appearance which we ordinarily associate with it and has assumed that untamed beauty and vigor which have so unspeakable a fascination for those who follow the northern rivers. Here along the cool shores the campion often mingles its clear white with the varied blues of the milk-vetch (*Astragalus alpinus*) or perhaps spreads its slender stems among the misty gray plumes of the Huronian tansy (*Tanacetum huronense*). Often, too, a patch of silver-weed (*Potentilla Anserina*) has crept in among the campion, here and there displaying the wonderful sheen of its yellow flowers, while a flash of white from its leaves tells that a stray breeze has crept up the stream.

In northern Maine and New Brunswick the campion is not restricted, however, to the rivers already named. During the scientific survey of 1861, Professor Goodale saw it on the Allaguash, and it is said to grow at Mirimichi and Richibucto. Nor is this plant limited in its riparian distribution to northern Maine and New Brunswick. It has been noted in Quebec, at Notre Dame du Lac on Lake Temiscouata, the chief source of the Madawaska river; it is said to be abundant with colt's foot on mountain streams in northern Vermont; and Professor John Macoun, the distinguished government naturalist of Canada, states that on the lower St. Lawrence it is found in the greatest profusion. In fact, almost a century ago it was detected on the St. Lawrence by the elder Michaux, sent to America by the French government in search of trees useful in the arts, though from his note, "in Canada, circa *Quebec* et loca habitata," one would assume that the plant was there introduced.

Excepting this northeastern colony of the campion, we have no indication that the plant is indigenous in America. It is common, to be sure, in many parts of Canada and the eastern states, but, wherever

it occurs in thickly settled regions, it is apparently of recent introduction from Europe, and its behavior is that of a weed. It delights, under such circumstances, in monopolizing waste places and roadsides, but it is rarely found along water-courses. In "the Aroostook"[1] and Madawaska,[2] on the other hand, it is very unusual to find the campion growing along roadsides or in the neighborhood of dwellings: personally I have seen it under such conditions only once and that was by the railroad at Fort Fairfield.

Another European plant which one sees everywhere along the St. John is the mugwort (*Artemisia vulgaris*). In 1861, Professor Goodale called attention to this, expressing surprise that, at the mouth of the Madawaska and at the Grand Falls, it was found on rocks with the native species (*A. canadensis*). But for some reason this is the habitat of the mugwort through the entire Madawaska region. Here it prefers the gravelly thickets, where, with its dissected foliage of dark green and white and its elongated, dusty-white spires, it makes a striking companion for the goldenrods and asters; and further north, at Notre Dame du Lac, it abounds in the thickets of raspberry, elder, and other indigenous shrubs. But in eastern America the mugwort is generally an introduced plant and, like the campion, has taken possession of many rubbish heaps and old fields. It should be noted, however, that, on Hudson Bay, the very form which grows on the St. John is considered indigenous; and that early in this century both Michaux, the French explorer, and Pursh, whose short brilliant career was so full of pathetic romance, regarded our own plant as native, for, in the words of the former it was found "in septentrionalibus Canadæ," and by the latter it was seen "on the banks of rivers; Canada to New England."

Many other European plants, less abundant on our northern rivers than the campion and the mugwort, should probably be considered with them. Among these are the field sow-thistle (*Sonchus arvensis*) and one of the hawkweeds, for the present considered a form of *Hiera-*

[1] "The Aroostook," a general name, in Maine, for the section drained by the Aroostook river and its tributaries; and, by extension, also applied to the country drained by smaller branches of the St. John as far south as the Meduxnakeag.

[2] Madawaska, that portion of Maine and New Brunswick drained by the St. John between the Grand Falls and Little Black river. The name, derived from Madawaska river, originally designated the settlement at its mouth, but is now applied to all the Acadian-French district of northern Maine and New Brunswick.

cium vulgatum. Early in this century the sow thistle was seen in Newfoundland, and in their recent explorations on that island, Dr. Benjamin L. Robinson and his companion, Hermann von Schrenk, found it on "gravelly banks in Salmonier River, exclusively with native plants as if indigenous." In northern Maine, too, this plant grows in just such situations. It is tolerably common on the St. John from the St. Francis, where it grows on gravelly banks with the alpine cinquefoil (*Potentilla tridentata*), to the mouth of Violette brook, where, at Van Buren, it abounds with such species as the Huronian tansy, the spurred-gentian, and the ever-present campion and mugwort. Unlike the latter species, however, the field sow-thistle, in its apparently native range in Maine, is not restricted to the St. John waters. It is locally abundant on the calcareous-slate cliffs and the gravelly shores of the Piscataquis in north-central Maine, growing luxuriantly by a water-fall with native shrubs and herbs. About Bras d'or Lake in Cape Breton, too, it is one of the commonest and most beautiful plants. When warned by the government botanist that they should eradicate what might quickly become a pest, the settlers replied that to them and their grandfathers the plant had always been known as a harmless species confined to the lake-shore. Yet this same sow-thistle, like the campion and the mugwort, is, in southern New England, a frequent weed by roadsides and in cultivated fields, where it has been recently introduced from Europe.

The hawkweed (*Hieracium vulgatum*), so far as known, has shown little tendency, like its cousins the orange hawkweed and the famous king-devil weed, to court civilization. Wherever found in the north it has been on shores or rocky banks, and not in cultivated or thickly settled regions. It grows on the Labrador coast, and according to Professor Macoun it is "frequent along river margins on Anticosti, and along the Gaspé coast from Cape Rosier to Matane; also on the heights of Point Levis. . . . It is probable that this species is common on both sides of the Lower St. Lawrence and along the shores of the gulf. It is certainly indigenous." In Newfoundland, Robinson and von Schrenk report it "in crevices of rocks by swift streams and waterfalls; Holyrood, and the cataracts of the Rocky river . . . to all appearances indigenous." In Maine the plant is rare, but on the Piscataquis river a form identical with the Newfoundland plant occurs, with the bird's-eye primrose (*Primula mistassinica*), the bladder-fern, and other strictly indigenous plants, in the crevices of wet cliffs near a

water-fall. Seventy miles to the northeast, at Island Falls on the Mattawamkeag river, at the foot of the rocky island, which, with the falls above it, has furnished the name for a prosperous young town, the spray-showered ledges are bright with the alpine bilberry (*Vaccinium caespitosum*), Kalm's lobelia, and this hawkweed; and below a wild fall in the Penobscot, not far from the Indian village at Oldtown, the plant abounds in a similar situation.

Along the northern rivers and shores, then, from Labrador and Newfoundland through Gaspé and eastern Quebec and thence south into New Brunswick and Maine, there are these common European plants, most of which are more or less introduced into the thickly populated regions as roadside weeds. Observers and authors have treated these plants in various ways. As already noted, Michaux and Pursh doubtless considered the mugwort native, and Asa Gray says it is "apparently indigenous at Hudson's Bay, etc.," though south of that region he considered it only an introduced plant. The campion, save on a few herbarium-labels, is nowhere recorded as indigenous. The field sow-thistle has usually been treated as an introduced weed, but, on the other hand, the hawkweed is pretty generally accepted as native. It must seem quite clear that, if the mugwort and the hawkweed are native plants, the campion and the field sow-thistle, growing with them or under the same conditions, must likewise be so regarded.[1]

Here, though, we encounter the question, what is an indigenous plant? In the Old World, where through ages the mingling of races has spread many plants from one end of the continent to the other, this must often be an unanswerable question; but in our own country there is at least one criterion, that of history, which may generally be applied. It is true that in the broadest sense we may not say what is native, for through the geological ages there has been a constant shifting of life from one place to another; and even to-day we may

[1] Other species of the same or more restricted range are seemingly indigenous, for example: *Ranunculus hederaceus* along Quiddy-Viddy Lake, etc., and *Nardus stricta* and *Triodia decumbens* on Rennies River, Newfoundland; *Tussilago Farfara* on river-banks, even well among the mountains, northern New England; *Achillea Ptarmica*, which "looks like a native at River Charlo, Restigouche Co., and Kouchibouguac, Kent Co.," New Brunswick; *Gnaphalium sylvaticum*, by streams, on muddy banks, and in clearings, northern Maine, New Brunswick and Cape Breton; and *Veronica arvensis*, in springy spots along the Aroostook and the Penobscot rivers. These and several others not here listed may have had the same origin as the northeastern colonies of campion, etc.

readily see the sudden appearance of wind-spread plants, like the fringed-gentian, in spots where they have hitherto been unknown; or, on our own St. John river, each spring we may see a wonderful washing down of species from the upper valleys to the rich basin of Kennebecasis Bay. The Indians, too, in their centuries of travel spread hundreds of species, long before we could take any account of them. Nevertheless, admitting such exceptions, we may fairly say that if the plant has not come to its present position through the direct or indirect influence of historic man, it is indigenous, otherwise it is introduced.

How about the plants in question? It is well known, as we have already seen, that, in thickly settled regions of America, at least three of these plants are known to be of European origin; but so are many other species, yarrow, plantain, etc., which are likewise undoubtedly indigenous in the northern parts of our continent. And there are scores of species, common like the campion, mugwort, field sow-thistle, and hawkweed in northern Europe, which are certainly indigenous in America. Among these are the bog bilberry (*Vaccinium uliginosum*, the rock cranberry (*V. Vitis-Idaea*), the yellow-rattle, (*Rhinanthus*) and the eyebright (*Euphrasia*), all of which (excepting a few coast and mountain stations) have in the east the same southern limit of distribution as the plants which are especially under discussion.

When, however, we look into their broad range in America, a significant fact appears. The yellow-rattle, for instance, grows in Labrador, Newfoundland, northern New Brunswick and Maine and in the White Mountains, on the New England coast, the northern shore of Lake Superior, in the Rocky Mountains, and thence north to Unalaska and the Arctic coast. Such in general is the range of all the plants which, coming from the north, reach in eastern America the same southern limit as the campion and its associates. The study of this peculiar distribution is one of the most important and fascinating problems for the northern botanist, but it must not now be allowed to take us far from the main subject. In this discussion we may accept without question the well-proved hypothesis that, prior to the glacial period, these plants were common in the circumpolar regions. As the glacial period came on the ice crept further and further equatorward and gradually drove all forms of life nearer the tropics. In time, when the ice-sheet covered New England, of course no plants could live here; but, as the ice melted away, those species which had

formerly adapted themselves to live near it found the proper conditions for their growth moving northward. Accordingly, as the ice receded further and further, these plants reproduced themselves and attained their greatest development more to the north than before. They were closely followed in their migration by others which required somewhat less arctic conditions, until a very general northward movement was made by all the plants crowded during the glacial period into the southern half of our hemisphere. The time has long since passed when the arctic species in their poleward march covered New England, the region of the Great Lakes and of the Rocky Mountains. But on the higher mountain-summits, on sheltered rocky shores, and on fog-enshrouded coasts these plants seem to have found congenial conditions; at least, on the upper Rockies and the White Mountains, on the northern shore of Lake Superior, on the eastern coast of New England, and in cool, sheltered spots in the interior, they have persisted as isolated remnants of a flora which once covered all the country about us, but which is now of general occurrence only in the far north.

Through continental Europe and parts of Asia, the campion, mugwort, field sow-thistle, and hawkweed are very common, and they even extend north to the Arctic Ocean. It would seem natural, then, that, if they were to be grouped with the other European plants, the yellow-rattle, etc., which have a similar range south of the St. Lawrence, we should find them throughout Arctic America, on the Great Lakes and in the Rocky Mountains. But this is not the case: the most northern recorded station seems to be that of the mugwort on Hudson Bay; and there are no records, as far as we know, for any of the four plants on our Arctic coast or in the Rocky Mountains. Considering, then, their very restricted range in America, it is probable that these plants were at some time introduced; but there are no available historic records by which this can be proved. There are surely no large towns in the forests of Maine, New Brunswick and Quebec, and it does not really seem probable that plants have been brought to the shores of our northern rivers through the means by which they ordinarily reach our city streets and waste places — the importation of foreign goods and the constant shipping from one place to another of packing in which the seed may have lodged.

The early history of the country through which these plants are found suggests, however, a possible explanation. In 1534, Jacques Cartier entered the Strait of Belle Isle and found French fishermen

already somewhat familiar with the Gulf of St. Lawrence. Winter quarters were established in 1535 near the present site of Quebec; and from this time the banks of the lower St. Lawrence were more and more visited by Europeans. At the end of the sixteenth century Newfoundland was already the scene of extensive fishing operations; and in a single season its waters were visited by three or four hundred fishing vessels, and more than a hundred habitations were built upon the island. Prior to 1600 the French had carried on explorations along the St. Lawrence; and from the days of their earliest settlements the Jesuit missionaries rapidly pushed into the entire country from Labrador, Newfoundland and Nova Scotia west to the Great Lakes. They early spread from the St. Lawrence through the northern wilderness to Lakes St. John and Mistassini and to Hudson Bay; and they very soon made their way to the Indian villages on the St. John, the Penobscot and the Kennebec.

Coming as they did from a thickly populated section of Europe where the campion, the mugwort, the field sow-thistle and the hawkweed are common plants — and it should be noted that the seeds of all these plants are provided with means for clinging to garments or anything with which they are brought in contact — it would be a most natural thing for the French, consciously or unconsciously, to bring with them a few seeds of these species. It would further surprise no one, who has seen the campion overrun the fields about Boston and Cambridge, that these plants should soon have established themselves along the St. Lawrence, whose current would greatly increase the rapidity with which they spread along its shores. And then it is certainly probable that, in their extensive travels from Quebec through to the northern country, or south into New Brunswick, Maine, or Vermont, the Jesuits carried with them a few clinging seeds of these plants. The singular point is that the campion and the mugwort do not grow in abundance on the shores of the Penobscot and the Kennebec; though on the latter river there is a small patch of campion on a gravelly bank at Carritunk, forty miles above the old Indian village at Norridgewock, where Sebastian Ràle so long had his ill-fated mission, but there it is evidently of recent introduction. This absence of the plants from the Penobscot and Kennebec shores may be due to the fact that, though the Jesuits came through from the St. Lawrence to these waters, the seed, which at first would have adhered to their clothing or rough blankets, would have been thoroughly brushed off after a few days

voyage on the St. John. Once started, however, on that river or its tributaries, it would require only a few years for such plants to gain a firm footing along the entire valley.

It will be remembered that the hawkweed (*Hieracium vulgatum*) is generally found in the neighborhood of water-falls and that the field sow-thistle, likewise, is apt to grow in similar places. Compared with the campion and the mugwort, neither of these plants produces many seed — the hawkweed rarely has more than a single clear-yellow head. May it not be that these plants were established in such spots by the voyageurs, who, when they came to the falls, would, in making the portage, shake out or at least disturb their blankets; and, though long established, the plants have never spread far, like the campion and the mugwort, because of their smaller number of seed?

Beside the original voyageurs and the river currents, there are other factors which have doubtless had a large share in the spreading of plants on the St. John. Reference is made to the Acadian settlers of the Madawaska region, and likewise to the modern canoeman and river-driver, though compared with the Acadians, their share has been a small one. The upper St. John valley from the Grand Falls to the Allaguash was long ago settled by Acadians. These people were largely those who came up the river after the pathetic expulsion of 1755. For a century and a half they have passed their simple out-door lives in comparative isolation. During most of that time their chief means of conveyance have been various forms of bateaux; and even now, with railroads rapidly tapping the country, many a solitary farmer from the St. Francis, the Allaguash, or the region toward Seven Islands annually fills his "dug-out" with oats or buckwheat and floats down stream to the mill at Fish River (Fort Kent of the Yankees). The constant travel of these people is the most effective means of spreading plants from the mouths toward the sources of the streams.

In this discussion little attention is paid to the early voyages of the Northmen, of John and Sebastian Cabot, of Gaspar Cortereal, of the Portuguese fishermen and their contemporaries early in the sixteenth century. They may have brought to this continent plants of European origin; but their cruising was chiefly along shore, and their settlements, when made, were only small and temporary, so that it is doubtful if they materially influenced the character of our northern flora. At any rate, there is nothing to suggest that they brought to us the four plants we are considering.

It is probable, however, that, though appearing indigenous on our northern waters, the campion, the mugwort, the field sow-thistle and the hawkweed are to be looked upon as European plants long ago introduced by the Jesuits. And just as about our cities and towns they often spread along highways, following the advance of commercial intercourse, they have become thoroughly scattered and established on the northern streams — the natural highways of the voyageur, the Acadian settler, the modern canoeman and the river-driver. If this be the true explanation, we should expect to find them on any of the rivers, the Saguenay, the Chaudière, and the Richelieu, for example, which are more or less directly confluent with the St. Lawrence. They are to be expected, in fact, on any stream which was followed by the Jesuits.

Daphne Mezereum in Vermont. — I wish to record in Rhodora a very attractive addition to our Vermont flora, *Daphne Mezereum*, Linn. The daphne is, of course, not uncommon in gardens. In Gray's Manual it is stated that it escapes from cultivation in Massachusetts and New York, but it is not recorded from northern New England. I find it scattered over several square rods of a wooded ledge near Burlington, Vermont, and in one place forming quite a thicket. Some of the stems are an inch in thickness, showing that they have been there for years. The plants flower and fruit abundantly, and seedling plants are very numerous. I have also received the daphne this spring from a correspondent in North Montpelier, Vermont, who reports it as a "wild flower" there. Doubtless it occurs in many places in the State, but has hitherto escaped record. — L. R. Jones, University of Vermont.

CRITICAL NOTES ON THE NEW ENGLAND SPECIES OF LAMINARIA.

William Albert Setchell.

(*Conclusion.*)

Taking the various characters enumerated into consideration, the New England species of Laminaria may be arranged and characterized as follows: —

DIGITATÆ. Blade split longitudinally into several or many segments.
Mucilage ducts present in both stipe and blade.
1. *L. platymeris* De la Pylaie.
Mucilage ducts absent in the stipe, present in the blade.
Stipe stout and decidedly compressed above.
2. *L. digitata* (L.) Edm.
" " f. *ensifolia* Le Jolis.
" " f. *typica* Foslie.
" " f. *complanata* Kjellman.
Stipe slender and flexible, slightly if at all compressed.
Blade undivided or split into few and comparatively broad segments.
3. *L. intermedia* Foslie.
" " f. *longipes* Foslie.
" " f. *cucullata* Foslie.
" " f. *ovata* Foslie.
Blade split into many and narrow segments.
4. *L. stenophylla* Harvey.
SIMPLICES. Blade undivided, elongated.
Stipe solid to the very apex, without mucilage ducts.
Mucilage ducts present in the blade.
5. *L. saccharina* (L.) Lam'x.
" " f. *normalis* Setchell.
" " f. *caperata* Farlow.
" " f. *Phyllitis* Le Jolis.
Mucilage ducts absent in the blade.
6. *L. Agardhii* Kjellman.
" " f. *normalis* Setchell.
" " f. *vittata* Setchell.
Stipe hollow above, without mucilage ducts.
7. *L. longicruris* De la Pylaie.

The following notes on these species may serve to indicate further the specific characters, and also to suggest certain points for further investigation.

A. DIGITATÆ. The four species under this group can generally be distinguished by the characters given in the key, at least from each other and from all species known with certainty thus far from the coast of New England. While the digitate species are common north of Cape Cod, they occur rather sparingly to the south of it. Additional species are to be looked for along the northernmost shores.

1. L. PLATYMERIS De la Pylaie. There is little to add to the description and remarks of Farlow (1881, p. 94) concerning this species. It is easily distinguished by its habit, its color, and its size from the other digitate species of northern New England, as well as by the possession of mucilage ducts in the stipe and hapteres. When fresh, or even when soaked out after being rough dried, it has a distinctive, penetrating odor quite different from that of any other of the New England kelps. It grows in the lower sublittoral, and even perhaps in the elittoral zone, epiphytic upon other large algæ. Its range is from Revere Beach northward. Its habit is well

shown by De la Pylaie's figure (1824, pl. 9, f. I.). It is very close to *L. Gunneri* Foslie of the Norwegian coast.

2. L. digitata (L.) Edm. The stipe in this species is stout and rigid, so that it remains erect under the weight of the blade even when the plant is left wholly or partially exposed by the recession of the tide. It is also decidedly compressed above in all its forms, and especially in the *forma complanata.* In these two characters are to be found the distinguishing features of the species, at least as far as the New England forms are concerned. A number of forms, presumably environmental, have been distinguished, most of which are to be found within our limits. The species is abundant north of Cape Cod, and occurs at certain exposed points to the south of it.

f. typica Foslie. In its most characteristic and easily recognized state, f. *typica* is a fairly large plant, with stipe long proportional to the blade, the base of the blade distinctly or even extremely cordate, and the divisions of the blade many and narrow. Foslie gives a characteristic figure of f. *typica* (1884, pl. 4, f. 1). The stipe is usually longer than the blade, but not always so; and while decidedly compressed above, is not so flattened as is the case in f. *complanata.* The base is usually heart-shaped, but is at times decidedly cuneate, especially in the plants from the south of Cape Cod. This form occupies the sublittoral and perhaps also the elittoral zone, seldom reaching that part of the sublitoral zone near the lower limit of the tides. It is common from Nahant northward, being cast ashore in great quantity on all the northern beaches. It is the only form of *L. digitata* which, to the writer's knowledge, passes Cape Cod to the southward. It is found cast ashore at such exposed points as Gay Head on Martha's Vineyard and Watch Hill, R. I., and comes ashore also in great quantity at New London, Conn. The writer has found plants of reduced size and cuneate base growing on piles on the "Ocean Pier" at Watch Hill.

f. complanata Kjellman. This form is to be distinguished from the preceding by its uniformly large size, and especially by the very decided flattening of the stipe just underneath the base of the blade. Kjellman's figures (1877, pl. 1, f. 14–18) show well the extent of this flattening. Kjellman's most striking example had the stipe 7.5 centimeters broad just below the transition place, and only 0.5 centimeters thick. The writer has seen specimens on the New England coast of measurements closely approximating these. The f. *complanata* is evidently a form of the deep waters, and has been found cast ashore at Nahant Beach, near Lynn, Mass., and on ocean beaches on Peak's Island, near Portland, Maine.

f. ensifolia Le Jolis. The stipe of this form is shorter than the blade and usually more or less curved. By these characters it is to be distinguished from both the preceding forms. Foslie's figures

(1884, pl. 8, f. 2 and pl. 6, f. 1) are very characteristic. It is a plant of the tide pools of the littoral zone and of more or less exposed shores in the uppermost part of the sublittoral zone. It is found plentifully from Nahant northward, but the writer has never seen a specimen of this form from south of Cape Cod.

3. L. INTERMEDIA Foslie. The weak, almost cylindrical stipe of this species, together with the usually ample and slightly divided blade, serve to distinguish it from others of the digitate section without mucilage glands in the stipe. It has been found with us only from the southern portion of the coast of New England. The writer has found it growing in great abundance, in the upper sublittoral zone (1–2 fathoms) at Ram Island near Noank, Conn., and H. M. Richards has brought it up from a depth of 4–5 fathoms off Newport, R. I. It has also been washed ashore at Newport, at Watch Hill and at New London. The forms of *L. intermedia*, as described by Foslie, have all been found at the Ram Island locality and near one another. The f. *ovata* is the one most commonly cast ashore.

f. LONGIPES Foslie. The long-stiped form is not common with us, but occasionally a specimen occurs which may be referred here.

f. CUCULLATA Foslie. The f. *cucullata* is, when well developed, a very distinct plant. As it occurs at Ram Island, with its short stipe and ample, very cucullate blade, split often into only three or four broad divisions, it looks unlike any form of *L. digitata*, but as cast ashore in smaller form, it is neither so cucullate nor so ample, yet has an entirely different aspect from any other digitate species. Foslie has given a very characteristic figure of it (1884, pl. 9, f. 2).

f. OVATA Foslie. Entire forms of this species are fairly common, and are especially to be found washed ashore. They appear to be rather young and undeveloped specimens. A typical plant is figured by Foslie (1884, pl. 10, f. 17.)

4. L. STENOPHYLLA Harvey. While what has seemed to the writer to be true *L. stenophylla*, is to be classed with *L. intermedia*, as regards the weakness and cylindrical form of the stipe; the affinities are rather with *L. digitata* as far as the numerous, narrow divisions of the blade are concerned. The stipe is very weak and almost cylindrical throughout its length; the blade is very narrow and decidedly cuneate at the base, and the divisions of the blade are relatively very numerous, narrow and deep. The plants seen by the writer all grew at the lower limits of the littoral zone, on exposed shores and on a substratum of mussels. The only localities where the plants were studied were Peak's Island and Nahant. In both of these places, the plants were exposed to heavy wave action. It is also found occasionally cast ashore. It has not been seen on the coast to the south of Cape Cod, with the exception of a few speci-

mens washed ashore at Newport, R. I. *L. stenophylla* appears to be an annual, differing in this from all other digitate species of the coast of New England except *L. intermedia.* It fruits in October and disappears soon after that. It never shows the rings in the cross-section of the stipe, which are so common in the older plants of *L. digitata.*

B. Simplices. While the digitate forms of the New England coast are easily to be distinguished from one another or by descriptions, and are also readily to be arranged under the species enumerated, it is quite otherwise with the members of the genus Laminaria with undivided blades. The numerous forms are neither readily recognized nor readily arranged, and all that can be done with them at present is to attempt some arrangement and leave them for future study. It has seemed best, for reasons given under each of the following species, to recognize three sets of plants belonging to this group.

L. saccharina (L.) Lam'x. There seems to be nothing to distinguish this species from the next, except the occurrence of mucilage ducts in the blade of *L. saccharina* and the absence of these structures from the blade of *L. Agardhii.* *L. saccharina*, in this sense, occurs in abundance north of Cape Cod, but has not, thus far, been detected to the south of it, although the search has been made with some thoroughness. The forms of this species are many, and not readily reducible under a few names; but the following enumeration may help somewhat in indicating the limits of the variation of the species.

f. normalis Setchell. The stipe of this form is long or short, but always much shorter than the blade. The base of the blade is cuneate when young, becoming orbicular, and even decidedly cordate, when adult. The blade is ample, thin and ruffled when young, with the two rows of bullæ, or alternate elevations and depressions, conspicuous. Later, the blade becomes thicker, though still ruffled and bullate, but finally in autumn this ruffled and bullate ample summer blade is replaced by a blade which is still thick, but perfectly plane, always lacking the bullæ and with only a trace, if any at all, of the ruffle. This is the common form on the northern coast.

f. caperata Farlow (as variety). The *L. caperata* of De la Pylaie is a well-marked form, or perhaps even a variety, of this species. In habit, it resembles *L. longicruris* very much, as may be seen from De la Pylaie's figure (1824, pl. 9, f. C.), having the stipe long, as compared with the blade, sometimes even longer than the blade, with the apical crook and sudden narrowing at the transition place of that species. The stipe is solid, however, and the blade has conspicuous mucilage ducts, so that it is to be regarded as a form of *L. saccharina* rather than of *L. longicruris*. The species appears to be annual, but that is not certain as yet, and careful observations should be made to determine this point. This form is

thrown ashore on the exposed beaches of the shore of Massachusetts, and also on those of Maine. The writer has seen it growing at Peak's Island, just below extreme low water mark. The blades of the latter specimens were noticeably broad.

f. PHYLLITIS Le Jolis. The young plants of this form of *L. saccharina*, delicate in texture and color, are falcate in general outline, and present so different an appearance from the young plants of the f. *normalis*, that they certainly seem to belong to quite another form at least. As the frond thickens, the falcate shape becomes less distinct, but the blade remains plane, for the most part, and later the plant disappears. It does produce scanty fruit at times. It has occurred most abundantly on the shore of Massachusetts.

6. L. AGARDHII Kjellman. As was stated under the preceding species, *L. Agardhii* differs from *L. saccharina* in no other respect than the absence of mucilage ducts in the blade. In variety of habit and manner of growth, the two species are identical, but it seems best to consider them as distinct, pending further investigations on the forms of our coast. The distribution of these two species is peculiar on the New England coast. *L. saccharina*, in its various forms, has been found only to the north of Cape Cod, while the abundant plants of Laminariæ of the Simplices section found to the south of the Cape, are all *L. Agardhii.* The latter species, however, does occur, though sparingly, to the north of Cape Cod, also. More extended search, with this point in view, may cause these statements to be modified. The forms of *L. Agardhii* are very similar to those of *L. saccharina*, except that no plants of the habit of *L. saccharina*, f. *caperata* have yet been found.

f. NORMALIS Setchell. The ordinary form of *L. Agardhii* presents the same variations as those described above for *L. saccharina* f. *normalis.*

f. VITTATA Setchell. Plants occur quite commonly on the southern shores of New England which resemble very closely plants of *L. saccharina* f. *Phyllitis*, but without mucilage ducts in the blade. They are in the most characteristic form, however, very much more elongated than the plants of that form, and the elongated forms occur also on the coast of Maine. The most striking plants of this form are those collected at Fox Island, Hunnewell's Point, Maine, by F. S. Collins, and a considerable number which were found growing on the piles of Ocean Pier, Watch Hill, R. I., by the writer. The stipe is short, from 2–3 centimeters in length, the base of the blade is elongated cuneate, and the blade is long and narrow, averaging from 30–65 centimeters in length and from 1–2 centimeters in width. The narrow plants may be regarded as the type of the f. *vittata*, but somewhat broader forms also occur, very similar in habit to the older forms of *L. saccharina* f. *Phyllitis.*

7. L. longicruris De la Pylaie. There is little to add to the general description of this species given by Harvey and by Farlow. It is one of the most striking and easily recognized of the species of Laminaria. It is common north of the Cape Cod region, growing in the tide pools of the lowermost littoral and in the upper sublittoral region. In some cases it may grow in the lower sublittoral and elittoral regions. It reaches a greater size than any other species of Laminaria, being at times 10–12 meters long and 1–1.5 meters wide. The stipe is long in proportion to the blade, with a distinct crook in the uppermost part, which is hollow, and abruptly constricted just below the transition place. South of Cape Cod it occurs at exposed points. The writer has found it growing on piles of wharves at Watch Hill, R. I., and at Ram Island, near Noank, Conn. It is also commonly washed ashore after storms at Watch Hill, R. I., and at New London, Conn.

The presence or absence of mucilage ducts in this species needs more careful investigation from the fresh material. Areschoug (1883, p. 8), Kjellman (1883, p. 233), Rosenvinge (1893, p. 846, 1894, p. 91, 1898, p. 52), and Guignard (1892, p. 36), all assert that there are mucilage ducts in the stipe, at least in the lower part, and Rosenvinge claims to have detected them even in the cortex of the hollow portion of the stipe. The writer has been unable to detect any mucilage ducts in the stipe of this species, but does find, at times, a circle more or less complete, of the perithecia of a species of sphæriaceous fungi, in the lower portion of the stipe of this and of *L. saccharina*, which has the appearance of a circle of mucilage ducts. This fungus is mentioned by Farlow in his New England Algæ (p. 10), and is of very common occurrence on the stipes of this species. It may be that this fungus, growing in such an unusual position, is the cause of the disagreement in regard to the stipe. The writer does not find mucilage ducts in the blade either; but this certainly needs more study with fresh and carefully fixed material. *L. longicruris*, in spite of its large size, seems to be an annual plant.

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REVERSIONS IN BERBERIS AND SAGITTARIA.

Robert G. Leavitt.

(Plate 19.)

That single individuals should recover characters lost, or at any rate intermitted for generations, is certainly a highly remarkable fact, for which we cannot as yet very clearly account. Thus in cattle spots of peculiarly colored hair sometimes appear that can be definitely traced to ancestors several generations removed. In horses, faint zebrine stripes — characters evidently of considerable antiquity — sometimes come on the shoulders, flanks, and legs, especially in colthood. These and a large body of similar cases of reversion are of course familiar to everyone through the writings of Darwin.

Darwin noted a peculiar instance of reversion in a species of Melilotus. In this genus the leaflets, in assuming the sleeping position, twist on their stalks, and during the night stand with surfaces vertical, one edge presented to the sky, the other to the earth. This is the case with fifteen species observed by Darwin. In one instance, however, a deviation was noted: new shoots from some cut-down plants at first acted, not like Melilotus, but like Trifolium, in which genus the customary sleep-movements are executed by the sharp upward bending of

the petiolules, so that the leaflets remain during sleep with their apices pointing toward the zenith. Darwin regarded this as probably due to the resumption of a primordial habit inherited from a remote ancestor allied to and sleeping like a Trifolium.[1]

The word "reversion" commonly means to us the reappearance of a *long-lost* character, or at least of some peculiarity which has jumped one or two, or a few generations. But there is no essential difference between reversions in this restricted sense, and the ordinary reproduction, without intermission, of the racial likeness from generation to generation. All the features of the adult, as regards form, color, *etc.*, are at each generation absolutely obliterated in the first, or unicellular, stage of the offspring. No length of years or passing of generations could make the obliteration more complete. The gap between the perfected parent form and the unicellular offspring is one compared with which the transition from the zebra-horse to the modern species is trifling. When the multitudinous peculiarities of form, color, temperament, action, of structure external and internal, survive the plunge and come safely through one such down-sinking of the organization, there is little increase of wonder — as there is no difference in the essential process — when one or another of these peculiarities delays a little in coming to light again, under the form of what we call a reversion.

Again, we think of reversions as characters that become fixed in the individual, when they appear. The reverting pigeon permanently retains its slate-colored plumage, the reverting sheep its dun-colored or black fleece. In plants a reversionary leaf is a matured-leaf — it may be on an immature plant — differing from the "full character" leaf, and owing its form to the revival — as we say — of an ancestral impulse. But it is a familiar story that in the history of any living thing an orderly series of figures from the past appears, transient revivings of old groups, — systematized reversions. The phenomena of inheritance are all of one sort, whether the reappearing traits are permanent or not, and whether they occur regularly or only occasionally.

In the development of any individual we have thrown before us dissolving views of extinct, precedent races; views for the most part indifferently focused, but clear enough to give us most important information of the natural affinities, along old lines, of the developing form. In both branches of biological science this has, of course, long been recognized, and studies of development have been most fruitful. Both

[1] The Power of Movement in Plants, p. 347.

embryonic and post-embryonic stages have been attended to, but the former by far the most thoroughly in both Zoölogy and Botany.

In Botany investigations of the young stages subsequent to the formation of the embryo, in order to discover hints of relationship that must disappear at a little later date in the life history, have been relatively few. But several workers are now paying attention to the matter, with good results. Some of the most interesting discoveries are coming from investigations of the minute anatomy of seedlings.

It scarcely need be said that the subject of reversions is of great importance in the study of the processes of heredity; and that in some respects plants make better subjects than animals in inquiries concerning the laws of reversion. Leaf-forms, in general simple, but in enough cases not simple to excess, are fit subjects for such inquiries.

BERBERIS. In Figure 1 of the accompanying plate I have represented a two-months' seedling of *Berberis vulgaris*. Were the young plant found growing wild, and at a distance from mature plants of the species, its parentage might not be suspected, the leaves are so unlike those of the adult condition in respect to the length of the petiole and the shape of the blade. The blade of the latter, or full leaf, is broader toward the apex and tapers very gradually to its junction with the extremely shortened petiole. The youthful lamina reverses this, being narrower above and more or less cordate at the base. It is distinctly jointed to the well-developed petiole, the earlier and later leaves thus agreeing in being unifoliolate.

Bushes of this species, four years old, from which I collected leaves last fall, still showed the leaf-character of the seedling in preponderance over shorter-petioled forms approaching the adult type. And, on isolated branches of old bushes, I have this spring found persistent petioles much longer than the normal, the stalks, without much doubt, of similar reversionary leaves. For I look upon the "abnormal" forms as good examples of reversion.

We might guess that we have here the reappearance of an ancient type from its constant occurrence at the period of life when both plants and animals manifest ancestral traits. A like trait in the seedling of an allied species, *Berberis Thunbergii* (Fig. 3), makes the inference of a reversion still more plausible.

Of course the final and irrefutable evidence of reversion is the direct comparison of the form in question with an ancestral type preserved in the rocks. But ancestral types are preserved also in living

forms. Indeed all organic forms are either directly or remotely ancestral, the parents being ancestors one generation removed. Of several species having a common origin some are likely to keep original traits longer than others, and do, as is well known in some cases, maintain the aboriginal organization almost entire and unchanged for immense periods of time. The required ancestral type may therefore often be found in existent species; what is occasional — youthful, senile, or of sporadic occurrence — in one form, being the habitual and characteristic condition in some relative.

This test of the reversionary nature of a particular youthful character, like the odd-shaped leaf of the Barberry seedling, must, as will be seen in the case of Sagittaria, be used with caution. In this case, however, the resemblance between the youthful leaf of *B. vulgaris* and the mature leaf of *B. repens* (Fig. 4) as regards both the length of the petiole and the shape of the terminal leaflet, seems to be well explained by supposing that the leaf of *B. repens* is very nearly like that of the progenitor of both *B. repens* and *B. vulgaris*; and that in youth our common species takes back to that progenitor, restoring the old form to the terminal leaflet, and the original rachis, but not the lateral leaflets.

Berberis vulgaris is a European and Asian form. *B. repens* is a western plant. *B. Thunbergii* is Japanese. Going to South America we find an interesting species for our present purpose in *B. Agapatensis*. The specimens examined were from Bolivia. Fig. 8 reproduces the outline of some of the mature leaves. In all but the somewhat lessened length of the petiole they agree with the seedling leaf of *B. vulgaris*. Most of the leaves of this species, however, show a little tendency to acuteness at the base.

Berberis Thunbergii is particularly curious as to the marginal teeth. The first set of leaves after the cotyledons, about four or five, are entire, and devoid of spinous processes. Following these are an equal number rather coarsely toothed, the teeth bristly-pointed. The remaining leaves of the first year become more and more like the characteristic leaf, *which again is smooth-margined, being without teeth and bristles*. The smooth leaf, next to the cotyledons, does not seem to be an adaptation to any circumstance of the seedling period, but rather a reversion to a type possibly older than that represented in the infancy of *B. vulgaris*. The succeeding rough leaves, again, have no apparent adaptive relation to the seedling period, and probably revive

a type now lost by *B. Thunbergii*, but retained in many species, — the bristly-margined type.

Berberis Thunbergii has by some authorities been treated as a variety of *B. vulgaris*. When we compare the seedlings we seem to find very positive evidence against any such assignment. If the two forms were so very closely related, their seedlings should be nearly or quite indistinguishable; we see on the contrary that they differ more markedly than the mature plants.

A point to be noted in both forms is that the reverting leaves exhibit an *added* character, as compared with the leaves of the adult plant. It would be easy to dispose of many cases of suspected primordial structure simply as cases of arrested development, in the sense of aborted growth. But here the feeble, seedling plant produces organs in one respect more highly organized than like organs of the mature plant.

The trifoliolate leaves of *B. repens*, Figs. 4 and 5, are not the full character leaves of that species; though to judge from a good number of herbarium specimens examined they are of rather common occurrence. The prevailing leaves have five parts, or even seven. The contour of the end leaflet is then altered (Fig. 6).

If, as is likely, *B. vulgaris*, *B. Thunbergii*, and *B. Agapatensis* are really unifoliate, then the trifoliate leaf of *B. repens* is probably near the type from which they have all been derived by reduction. *B. Aquifolium*, a more complex form, reverts only occasionally from its more advanced position to the type characterized by the cordate terminal leaflet; at least in the adult plant.

Sagittaria. In estimating the value of youthful characters for the reading of family history, we must take into account the influence of the requirements of the seedling, as differing from those of the adult. The forms of cotyledons, for instance, are traceable to the form of the fruit, the need of storing nourishment, and the exigencies of confinement in small spaces. The contours rarely bear any relation to the contours of the ordinary foliage leaves, present or past. Similarly after germination the young plant may encounter problems that never recur subsequently, and meet these problems with specialized structures having no connection with ancestral mature types. In the Sagittaria, for example (Fig. 7), the interpretation of the linear first leaves (*a*, *b*, *c*) is complicated by the fact that the seedling is submerged, while the hastate or sagittate adult leaf is aërial. Was there ever a time when

the Sagittarias possessed no more highly differentiated leaf than the present ribbon-form leaf of the seedling?

It is easier to answer the question with reference to the spoon-shaped intermediate leaf (*d*). In the old-age of the plant — that is, of any particular shoot of the branching rhizome in the species represented — the leaves retrace the course of development as the vegetative vigor becomes exhausted and second childhood comes on. The series *f*, *g*, *h* Fig. 7, is a reversionary series, beginning with hastate forms more and more unlike the sagittate character leaf, and ending with very narrow-bladed lanceolate forms. These latter stand well out of water, so that the direct action of that medium is eliminated from the case, and even were there no other Sagittarias and the Alismas, we might be tolerably sure,— from the *double* appearance, in youth and in old age, — that the lanceolate form represents a return to what was once the farthest limit of differentiation.

The nature of the linear, grass-shaped early leaves of the seedlings and new shoots, which seem to be the same thing as the ultimate leaves of several species, is perhaps doubtful. They are spoken of by several writers as *phyllodia*. If the term has any distinctive meaning, it implies reduction from a bladed to a bladeless condition. The linear leaves are looked upon as petioles, with the notion that a part normally produced in addition to and beyond these bodies is suppressed through the influence of the surroundings.

Seedling stages should throw light on the question. *Sagittaria Montevidensis*, of South America, passes through its seedling stages very slowly, and presents a very complete series of transitional forms. In these there is every indication that the lanceolate or elliptical blade (*d*) is derived from the linear forms not by addition at the tip, but by gradual differentiation of the terminal region of the linear leaf to form the ultimate blade, while the lower part of the original body (or blade) becomes gradually thickened and then rounded to make the ultimate petiole. If this is so, the grass-shaped early leaves are not reduced forms in the sense appertaining to the *phyllodia* of the Acacias. They are in fact probably not *phyllodia*; they seem to be early complete forms giving rise by progressive and structurally necessary steps to the adult differentiated leaf.

The linear leaves of the seedling, forming in this manner the basis of an evolution toward the full character leaf, seem little like cases of what the zoologists would call larval adaptation. It is probably not

unreasonable to interpret them as reversions to a primitive type of Sagittaria. That prototype may have been a submerged plant.

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EXPLANATION OF PLATE 19. Figure 1, a growing seedling of *Berberis vulgaris*. 2, characteristic leaf of the same species. 3, a pressed seedling of *B. Thunbergii*. 4, reversionary leaf common on *B. repens*. 5, one of six very large, 3-foliolate leaves on a sucker-like shoot of *B. repens*. 6, the character leaf of the same species. 7, stages in the development of *Sagittaria Montevidensis*: *a, b, c, d, e* progressive forms; the character leaf, sagittate, not represented; *f, g, h* regressive forms in exhausted shoots.

THE OCCURRENCE OF THAMNOLIA IN MAINE.—The rare alpine lichen Thamnolia has not before been reported from Maine, and the following note may be of interest. In August, 1896, the writer collected near the summit of Mt. Washington, New Hampshire, the typical form of *Thamnolia vermicularis* (Sw.) Schaer.; and in September, 1898, an interesting form of the same species was found near the summit of Mt. Katahdin in Maine. Specimens of the latter form were sent to Miss Cummings, who determined them as *Thamnolia vermicularis*, var. *subuliformis* Schaer., and stated that in the Tuckerman Herbarium there was but one representative of the type.

In habit of growth the variety is strikingly different from the type, this feature being more marked than the shape of the thallus. The type as collected on Mt. Washington was growing in densely cespitose bunches, and the variety, as on Mt. Katahdin, was not at all cespitose, but was very scattered, often isolated and intermixed with other lichens and mosses, notably with *Cetraria Islandica*. It was found only sparingly, and no specimens of the typical form were observed.

This species resembles at first sight a dead or bleached form of some of the alpine species of Cladonia, but its color is very distinctive. Owing to its silvery gray shade and its subulate thallus it is a very beautiful and striking species. — ELMER D. MERRILL, Washington, D. C.

ASPIDIUM SIMULATUM IN NEW HAMPSHIRE. — *Aspidium simulatum* was illustrated and described by Mr. George E. Davenport in the latter part of 1896. Since that time it has been reported from comparatively few stations over a wide range. The writer is not aware that this fern has been reported from but two localities in New Hampshire, namely, Seabrook and Kingston. These towns are in close proximity,

and but just outside the Massachusetts boundary. In September, 1899, this fern was found in considerable quantity in a small piece of low woods in Contoocook, N. H. This station takes the fern well into the State, and is an intermediate station in the large gap that at present exists between the most northern of the New Hampshire stations and the southernmost Maine station. — F. G. Floyd, Boston, Mass.

Plantago elongata in New England. — The little plantain commonly known as *Plantago pusilla*, Nutt., but more properly called *P. elongata*, Pursh, extends across the continent from east to west, but from north to south its range is limited. According to the Synoptical Flora, it is found along the Atlantic coast from southern New York to Virginia. Britton and Brown's Illustrated Flora also gives southern New York as the northeastern limit of its growth. I have not seen any report of its occurrence in New England. In the Catalogue of Flowering Plants growing without cultivation within thirty miles of Yale College, published in 1878 by the Berzelius Society, it is given as found "On Long Island." It was very probably collected there by Mr. E. S. Miller, who contributed much material for this catalogue. A little nearer to us, yet still in the State of New York, is the station discovered by Dr. C. B. Graves, who, in 1892, collected the species on Fisher's Island.

It was my good fortune, on May 10, 1900, to find this little plant at Black Hall, near the mouth of the Connecticut River, in the town of Lyme, Connecticut. It was growing on a sandy bank by the roadside, about half a mile from the seashore. With it was growing *Draba verna*, L., and also another plant that, according to my experience, is not common in this section, namely, the Corn Speedwell, *Veronica arvensis*, L.

The discovery of *Plantago elongata* at this station is interesting, as showing that the plant has by some means crossed Long Island Sound, and may be expected by collectors along the seashore in Connecticut, Rhode Island, and southern Massachusetts.

How abundant the plant is at this place I cannot say, or how widely distributed in the neighborhood. The station is far from my usual collecting ground, and my time was limited. I secured in all probably fifty or sixty plants. A specimen from this station has been sent to the Gray Herbarium. — C. H. Bissell, Southington, Connecticut.

INFORMATION DESIRED CONCERNING PLANTS DOUBTFULLY ASCRIBED TO THE FLORA OF VERMONT. — The Vermont Botanical Club expect to publish, in August, a catalogue of Vermont plants, admitting only such species as can be verified by extant specimens. The Committee on Preparation have been unable thus far to verify the following species, reported for Vermont by the older botanists. Any botanist knowing of Vermont specimens or stations for any of the plants in this list will confer a favor by reporting the same to the secretary of the club, Prof. L. R. Jones, Burlington, Vermont: —

Anemonella thalictroides, Spach.
Cimicifuga racemosa, Ell.
Ranunculus sceleratus, L.
Linum Virginianum, L.
Desmodium canescens, DC.
Lespedeza repens, T. & G.
Viola pedata, L.
Cornus florida, L.
Asclepias purpurascens, L.
Asclepias verticillata, L.
Hydrophyllum Canadense, L.
Gerardia flava, L.
Mentha Canadensis, var. *glabrata*, Benth.
Galeopsis Ladanum, L.
Podostemon ceratophyllum, Michx.
Urtica dioica, L.
Smilax rotundifolia, L.
Hypoxis erecta, L.
Potamogeton pulcher, Tuckerm.
Scirpus polyphyllus, Vahl.
Scleria triglomerata, Michx.
Solidago odora, Ait.
Eragrostris capillaris, Nees.
Festuca tenella, Willd.
Glyceria obtusa, Trin.
Isoetes Engelmanni, var. *gracilis*, Engelm.

A COLONY OF ALNUS GLUTINOSA IN EASTERN MASSACHUSETTS. — The European *Alnus glutinosa*, Willd., seems to be fairly well established along the upper part of Whitmore Brook, West Medford, and about the swamps drained by it. From twenty-five to thirty specimens have been observed in this locality, varying in size from the shrub of a few feet to a tree thirty-five to forty feet in height. A few years ago this colony was much more numerous, but recently several of the largest trees were sacrificed in the improvement of an estate. No record has been found of the introduction of the species in this place. — C. H. MORSS, Medford, Massachusetts.

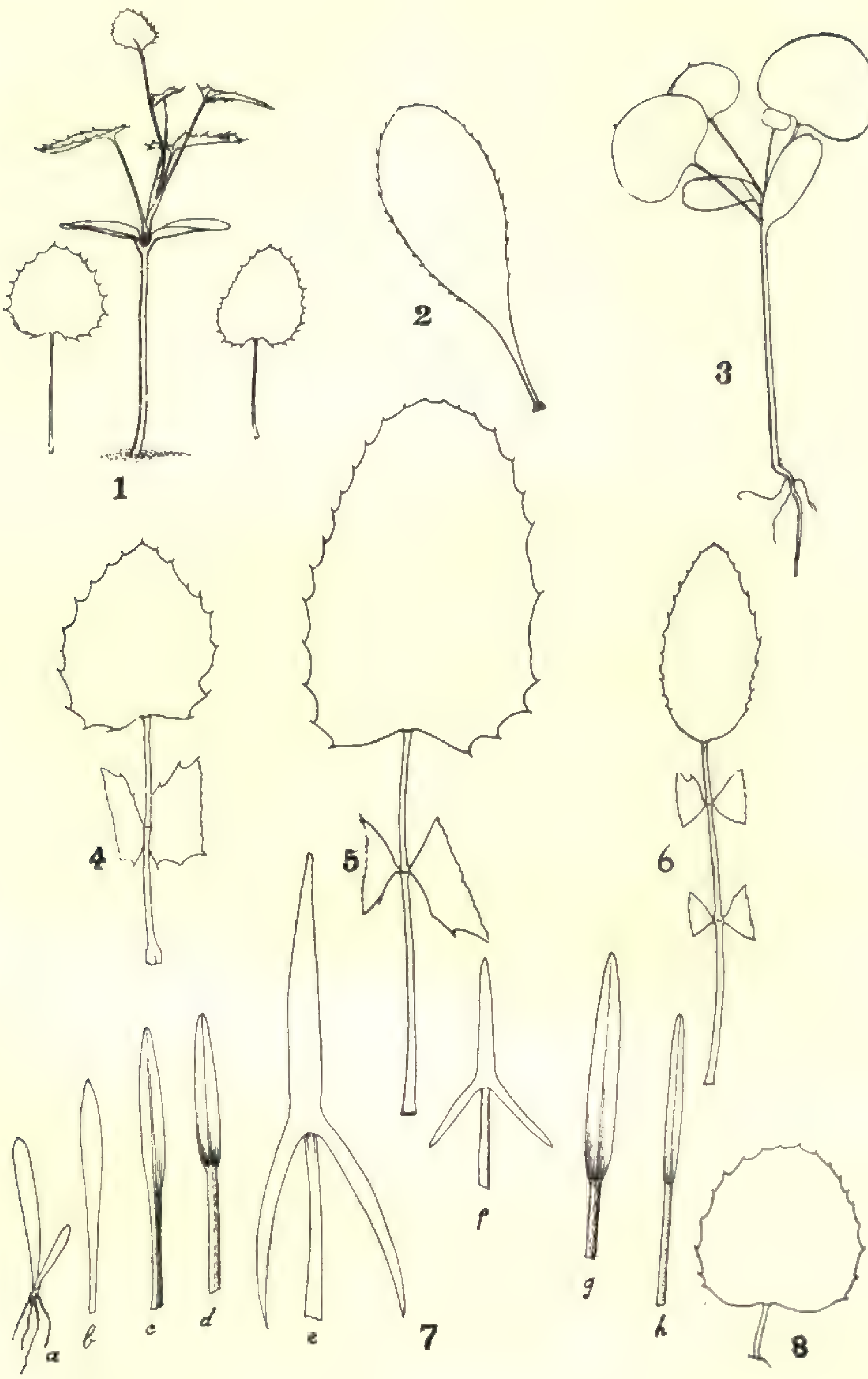
A FLORA OF MANCHESTER, NEW HAMPSHIRE. — The manifold activities of the recently organized Manchester Institute of Arts and Sciences have been placed upon permanent record in a neatly printed volume (1) of its Proceedings.[1] The most important feature in the

[1] Manchester, New Hampshire, 1900; 8vo, pp. 158.

report of the Botanical Section is a local flora of Manchester and vicinity compiled by Mr. Frederick W. Batchelder. The flora is restricted to the pteridophytes and spermaphytes, and is arranged according to the sequence of Engler and Prantl's Natürlichen Pflanzenfamilien. The author enumerates 817 species and varieties of plants within his limits, and adds a brief statement regarding the frequency of each. At the end of the list are several pages of valuable notes likely to stimulate observation upon the more critical species. On page 74 occurs the new combination, *Glyceria borealis*, Batchelder (*Panicularia borealis*, Nash). The abundance of oaks, of which Mr. Batchelder enumerates no less than nine, is in striking contrast to their paucity in the upland regions of southern New Hampshire.

Parietaria debilis in New Hampshire.— In August, 1896, while on a bicycle trip to Nottingham, New Hampshire, I paid a hurried visit to Pautuckaway Mountain, where many rare and interesting plants were observed. Among them was a prostrate, vine-like weed, which had a familiar aspect, but which I could not readily place in the botanies of this region. By referring to the Botany of California, however, I found it to be *Parietaria debilis* Forst., and then remembered it as a common plant of the Sierra Nevada Mountains. Some seed planted in 1897 produced a few plants. I was unable to find any more in the original locality in 1899, but this was probably owing to the extreme drought. Although a homely weed, this plant is an interesting find in New Hampshire, since it is far out of its range and is new both to Gray's Manual and Britton and Brown's Illustrated Flora. — A. A. Eaton, Seabrook, New Hampshire.

Vol. 2, No. 18, including pages 107 to 132, plate 18, and a portrait (unnumbered) was issued June 21, 1900.



R. G. Leavitt, del.

REVERSIONS IN BERBERIS AND SAGITTARIA

Rhodora

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NOTES OF A WILD GARDEN.

G. U. Hay.

Possibly some of the readers of Rhodora may be interested in the experiment of a wild garden which I planned and started some twelve years since, on a two-acre lot about eleven miles from the city of St. John, New Brunswick. The plan was somewhat ambitious, being intended to show within this small area all the flowering plants and ferns, and their allies of New Brunswick, with possibly a few others, trees and shrubs from other latitudes, for the purpose of comparison. The latter are kept quite distinct from the "Natives" in the cultivated or open portions of the garden.

The abundant shade of a fine grove, with a northern exposure and a depression running through it, in which is retained ample moisture during the dry season, furnishes a suitable habitat for ferns and other plants requiring shade and moisture. The rocks and miniature gorges of the grove have welcomed the ferns especially; and, almost without effort, beyond the transplanting, these interesting plants of the provinces, with but few exceptions, have flourished in the natural home provided for them. And here it may be said, the whole aim in the management of the garden has been to let nature have a free hand with the exception of necessary clearing and pruning, and to obey her more obvious dictates.

In one corner of the garden is a meadow very suitable for the plants from the alluvial river bottoms of the upper St. John and its tributaries, and the Restigouche and other rivers of the Province. This meadow represents considerable toil as well as pleasure, but the results have not always been what my too sanguine hopes led me to expect. The meadow was teeming with vegetation when I began, and the original inhabitants have made a stern fight against extirpation in

order to afford a habitat for the northern hordes brought in to disturb their hitherto peaceful life. But as I look upon those transplanted ones, that have grown and flourished, they recall — and I live over again — canoe voyages on northern rivers, tent-life amid woodland scenery, the sight of large game in these solitudes, deadly struggles with small game, such as mosquitoes and black flies, as I dug up the coveted treasures and, with wearied arms and back, toiled through thickets and bogs to bring them safely to their destination.

But the *pièce de resistance* in this meadow has been the brook. *My* plan was to turn it aside in quiet bays and little placid lakes, on whose bosom should repose water lilies, and where I should have at a glance all our aquatic plants. But the turbulent little stream, dashing down from the adjacent hill sides, has carried away — root and branch — the plants placed too confidingly within the limits of its bed. It refuses to become a partner to my scheme and emits a gurgle of delight at every fresh failure of mine to win it over, or at least to secure its passive non-resistance.

Beyond, to the southward, there rises a hill whose fertility has been drained to enrich the grove and meadow below it. The soil is dry and poor, covered with a growth of pines, firs, birches, shrubs and heath plants. Here the Heather (*Calluna vulgaris*), transplanted from Point Pleasant Park, Halifax, has flourished for several years — an evidence of the sterility of the soil. Here stands an aged white pine, the sole survivor of a fire which swept over the place scarcely two decades ago. The scarred and blackened trunk and upper branches, extended imploringly, tell of its struggle for life. Crossing a slight depression another knoll is reached on which stands a small summer cottage where I shall be glad to welcome any reader of Rhodora and show him, in part at least, a wild garden of New Brunswick plants, with, alas, the graves of some of those that have perished because of the too near approach to the Bay of Fundy's chill fogs and winds.

In the garden there are over five hundred species of flowering plants and ferns, many of which were *in situ*, while others have been planted during the past twelve years. The ferns, trees and shrubs, and those flowering plants most easily transferable are more largely represented. The ferns embrace a nearly complete list of this class of New Brunswick plants. The trees and shrubs are also well represented. Of the eighty species found in the province more than two-

thirds are growing and in good condition, and in a short time I hope to have this portion of our flora complete. Little or no attempt has been made to arrange the plants according to any system of classification, the chief aim being to provide natural habitats and surroundings, as far as possible. For a record of observations, made up to the end of the season of 1898, on the plants of the garden I may refer any one interested to Bulletin XVII of the Natural History Society of New Brunswick.

St. John, New Brunswick.

THE FRUITING OF RICCIA NATANS.

A. B. Seymour.

Riccia natans is abundant in a small pond near Mount Auburn, Cambridge. Early in the season the surface of the pond is well covered with it, as observed by Prof. L. M. Underwood and myself in 1891. Presumably, it abounds every spring, but I have given it no attention since 1891, till now. Early this spring it was floating in great abundance along the shore of the pond. In June the pond, which is shallow, becomes filled with a growth of water-grasses and other plants, and the water in the pond is considerably lower than at first, even in a season that is not very dry.

The tendency of the winds is to wash the floating *Riccia* ashore and as the water recedes the plants are left on the mud. Weeds soon spring up and hide them.

I have heard conflicting reports regarding the fruiting of this plant. One says it fruits floating, another that it fruits on the mud. The fact is, that fruit is found after the spores have had *time to mature.* I have examined the plants this spring, from week to week, from the earliest indication of fruiting to the completion of mature spores. The first mature spores were found about June 1, on both floating plants and those fixed to the mud. Now, at the end of June, no floating plants are seen. Plants on the mud have abundant spores at full maturity. The fruit is figured in Gray's Manual.

Cambridge, Mass.

THE NEW ENGLAND SPECIES OF DICTYOSIPHON.

F. S. Collins.

The genus Dictyosiphon was founded by Greville in 1830, on the *Conferva foeniculacea* of Hudson, which, for a long time, was the only species. There are now about ten species recognized, all but one inhabiting the North Atlantic and Arctic oceans, extending also a short distance into the North Pacific. The one exception, which, when better known, may have to be transferred to another genus, occurs in South Pacific and Antarctic waters.

The genus is characterized by a terete, more or less abundantly branched frond, growing by an apical cell, by whose rapid division and the repeated division of the segments cut off, the frond is formed; consisting of an inner layer of rather large, loose, colorless cells, elongated in the direction of the length of the frond, and an external layer of small, roundish or squarish colored cells. Unilocular sporangia, spherical or flask-shaped, are formed in the cortical layer, immersed or slightly projecting; plurilocular sporangia are unknown.

There are two subgenera, characterized thus: —

EU-DICTYOSIPHON.

Species of large size, slender, filiform, little or not at all gelatinous; branches and ramuli not attenuate at the base; cortical cells small; sporangia usually scattered, single.

COILONEMA.

Of smaller size; branches of first and second orders long, sub-simple, hollow, inflated, tapering to both ends, especially to the base; cells of the cortical layer large, rounded; sporangia in groups.

Not one of the characters given above, however, is always to be depended on; indeed, in a good proportion of individual plants, some characters of one subgenus will be found combined with characters of the other.

Specific limitations are vague; very distinct types can be selected, but all possible intermediate forms are found, and the determination of individual specimens is often a matter of considerable difficulty, and sometimes impossible. The following key will only approximately indicate the New England forms:

Frond with stout percurrent axis and simple branches of nearly uniform length, *D. Macounii* Farlow.

Frond quite slender, simple or with very few branches, *D. Ekmani* Areschoug.

Frond repeatedly branched,
All branches nearly the same size as the main stem.
Branches not contracted at the base, *D. hippuroides* (Lyng.) Kuetz.
Branches contracted at the base,
D. hippuroides var. *fragilis* (Harv.) Kjellm.

Branches of successive orders smaller and smaller, the ultimate very slender,
All except the oldest parts beset with uniformly short ramuli,
D. hispidus Kjellman.
No definite short ramuli; branches not contracted at base,
D. foeniculaceus (Huds.) Grev.
No definite short ramuli; branches contracted at base,
D. foeniculaceus var. *Americanus* Collins

It will be noticed that no account has been made of color, although nearly all descriptions speak of *D. hippuroides* as being dark brown, *D. foeniculaceus* and *D. hispidus* light brown. The writer's experience is that in the living plant age and exposure have more influence than have specific differences ; while in the dried specimens the manner of preparation may make more difference than anything else.

Altogether the most common form in Europe is *D. foeniculaceus*, the type of the genus ; but in New England it seems to be not very abundant, at least in its typical form. The main stem bears numerous alternate branches, each bearing branches of the second order, followed by third and other orders, each order being more slender than the preceding, the ultimate very fine. Occasionally the main stem and some of the larger branches are hollow, otherwise all are solid.

In Southern New England the typical form is seldom found, but its place is taken by what appears to be an undescribed variety, for which I propose the name var. Americanus. The contracted bases of the branches, the often longitudinally seriate cortical cells, and the sporangia frequently in groups, show a tendency to the subgenus Coilonema, while the size of the plant, the branches of several orders growing successively more slender, agree with typical *D. foeniculaceus*. In habit it resembles *Striaria attenuata*, Grev., more than it does typical *D. foeniculaceus*. The northernmost point at which it has been found is at Weymouth, Mass. (F. S. C.), in the warm water colony established there. It is the common Dictyosiphon at Newport, R. I. (Mrs. W. C. Simmons), and at Bridgeport, Conn. (Isaac Holden). South of New England it extends at least as far as Atlantic City, N. J. (S. R. Morse). It occurs chiefly on *Phyllitis fascia* (Fl. Dan.) Kuetz., in less frequency on *Scytosiphon lomentarius* (Lyng.) Ag., and occasionally on other algae ; it is found chiefly in spring.

The plant which in northern New England has passed largely for *D. foeniculaceus* appears to be rather *D. hispidus* Kjellm. In general habit it is not unlike the older species ; the branching is abundant and pretty regularly alternate, and the younger parts are uniformly beset, often quite densely, with subulate or filiform ramuli, two or three cm. long. These appear to be of a distinct class from the normal branches, and of limited growth, remaining of the same dimensions, while normal branches continue to grow and branch indefinitely. The writer has collected this species at various points from Nahant, Mass., to Mount Desert, Maine, and it probably continues along the Canadian shore, as it occurs in Greenland, Spitzbergen and Norway. It seems to prefer rocky pools on rather exposed coasts, and grows by preference on *Chordaria flagelliformis* (Fl. Dan.) Ag. It is in its best condition in July and August.

D. hippuroides (Lyng.) Kuetz, like the last species, has often passed under the name of *D. foeniculaceus*, and it must be confessed that it is not easy to distinguish the two. *D. hippuroides* is a coarser plant, less branched, the branches of various orders more nearly of the same size and less tapering. Our plant, as compared with the European forms, is of looser structure, and has a larger central cavity. It is our largest species, and in favorable situations may reach a meter in length. What appears to be a reduced form, not over a decimeter in height, is found at Newport, R. I. (Mrs. Simmons). There is no other record of its occurrence south of Nahant, but from that point north it is common, usually growing on *Chordaria flagelliformis*, occasionally on other algae.

D. hippuroides var. *fragilis* (Harv.) Kjellman, has the branches of the first order of nearly the same diameter throughout, except at the base, where they are distinctly constricted ; branches of higher order than the first are few ; the general habit is that of the subgenus Coilonema, and extreme forms also resemble *D. Macounii* Farlow. It is common at Marblehead Neck, Mass., in company with the type, both on *Chordaria flagelliformis*.

In the typical form of *D. Macounii* Farlow there is a stout main axis like a Scytosiphon, and similarly hollow ; from this issue numerous branches of nearly uniform length, and seldom divided or branched ; they are either straight or incurved, and taper to both ends. This form occurs in the Gulf of St. Lawrence ; only a reduced form, approximating *D. hippuroides*, occurring in New England. This was

found by the writer at Mount Desert, Maine, in tide pools, in company with *D. hippuroides*, in July.

D. Ekmani Areschoug is a smaller plant than any of the species yet named, the fronds seldom exceeding five cm. in length. They are normally simple, but sometimes have a few short branches. They are very slender, in the American form of nearly uniform diameter, while in the European form they are considerably larger in the middle than at either end. The sporangia are full as large in this species as in the others, somewhat larger in the American than in the European form. It is a plant of the upper tide pools, growing on *Scytosiphon lomentarius*, which it covers quite densely. It is common about Nahant in spring and early summer, extending northeast to the boundary, and is found also at Yarmouth, N. S. (Herb. Farlow.)

Though these are all the forms that occur within our limits, it may not be amiss to mention two forms that occur in Northern Europe and Greenland, and that may be expected to be found on the coast of Maine. *D. foeniculaceus* var. *flaccidus* Kjellm. has stem and main branches tubular, larger than in the type, but soft and easily torn. *D. corymbosus* Kjellm. has a short axis and long, subequal, nearly simple branches, not constricted at the base.

The following summary will give the more important references for the species named, and some synonomy: —

D. FOENICULACEUS (Huds.) Grev.

Greville, Algae Britannicae, p. 56, Pl. VIII.

Farlow, N. E. Marine Algae, p. 66.

Phycotheca Boreali-Americana, No. 673.

Conferva foeniculacea Hudson, Flora Anglica, p. 594.

var. FLACCIDUS (Aresch.) Kjellm.

Kjellman, Algae of the Arctic Sea, p. 268.

D. flaccidus Areschoug, Observationes Phycologicae, Part 3, p. 31.

var. AMERICANUS Collins.

Phycotheca Boreali-Americana, No. 674.

D. HISPIDUS Kjellm.

Kjellman, Algae of the Arctic Sea, page 270.

Phycotheca Boreali-Americana, No. 677.

D. foeniculaceus subspecies hispidus Kjellman, Spetsbergens Thallophyter, Part 2, p. 39, Pl. II, fig. 1.

D. HIPPUROIDES (Lyng.) Kuetz.

Kuetzing, Tabulae Phycologicae, Vol. VI., p. 19, Pl. LII, fig. 2.

Farlow, N. E. Marine Algae, p. 66.

Farlow, Anderson & Eaton, Alg. Am.-Bor. Exsicc., No. 95.

Phycotheca Boreali-Americana, No. 675.

Scytosiphon hippuroides Lyngbye, Hydrophytologia Danica, p. 63, Pl. XIV, B.

var. FRAGILIS (Harv.) Kjellm.

Kjellman, Algae of the Arctic Sea, p. 268.

Phycotheca Boreali-Americana, No. 676.

D. fragilis Harvey in Kuetzing, Species Algarum, p. 485; Tabulae Phycologicae, Vol. VI., p. 19, Pl. LII, fig. 1.

D. MACOUNII Farlow.

Farlow, Bulletin Torrey Bot. Club, Vol. XVI., p. 11, Pl. LXXXVII, fig. 1.

D. EKMANI Aresch.

Areschoug, Observationes Phycologicae, Part 3, p. 52.

Phycotheca Boreali-Americana, No. 533.

D. CORYMBOSUS Kjellm.

Kjellman, Algae of the Arctic Sea, p. 267, Pl. XXVI.

The writer is indebted to Dr. L. Kolderup-Rosenvinge, of Copenhagen, for specimens of Dictyosiphon from Europe and Greenland, and for notes as to the differences between the American and the European forms.

ASTER CONCINNUS IN NEW ENGLAND.

L. ANDREWS.

EARLY in September, 1898, while botanizing with Mr. C. H. Bissell along the foot of the precipitous cliffs of Meriden Mountain in Connecticut, we found, growing with the little fern, *Asplenium Trichomanes*, in the crevices of the rocks, a peculiar form of Aster. As these rock-crevices are usually very dry and devoid of soil, rarely supporting more than a small amount of vegetation, the occurrence of these Asters was very noticeable. A few specimens were collected, and, after drying, were examined, but with very unsatisfactory results.

Later, in making up a package for the New England Botanical Club, one of these strange Asters was included. The following portion of a letter, dated June 9, 1900, from Mr. M. L. Fernald, phanerogamic curator of the club herbarium, gives the result of his investigation.

"Your No. 674, *Aster* from 1,000 feet on Meriden Mountain, proves to be the extremely rare and little known *A. concinnus*, Willd. I have compared it with authentic specimens, which have themselves been verified by comparison in the Willdenow herbarium, and feel no hesitation in so placing it. The plant is one of the rarest and least known of American species and, though Dr. Gray doubtfully referred a few more southern specimens to it, your plant much better matches the authentic specimens which we have than does anything else I have seen. Other New England collectors have sent me plants under the name *A. concinnus*, but theirs have thus far proved to be forms of *A. laevis*. Your plant, as you will see, has thinner, greener leaves than that species, and the bracts are thin and linear-attenuate, not unlike those of *A. longifolius* or *A. paniculatus*. I hope you will watch the plant this year and secure us some good material. I am sorry that I did not detect the plant in time for your Flora of Meriden Mountain."

In the Synoptical Flora of North America, Dr. Gray says of *Aster concinnus:* "North America, received by Willdenow from Muhlenburg. An indigenous specimen from Pennsylvania, *Minn*, in herb. Cosson. This and perhaps that of North Carolina, *Schweinitz* in herb. Ell. (now lost), and Arkansas, *Harvey*, seem to be the only indigenous ones seen." We now have the pleasure of announcing in the pages of Rhodora an additional station for this extremely rare species.

Southington, Conn.

A FEW ADDITIONS TO THE NEW HAMPSHIRE FLORA.

Alvah A. Eaton.

The lists of New England plants which appear in Rhodora are very helpful to the general collector, showing him where knowledge is deficient and observation demanded. They should also help compilers of botanies so that no future work need leave a large percentage of a state's flora unrecorded.

" Massachusetts and South " is the limit of many plants found over the line in New Hampshire, and just about ten per cent of the plants found in this neighborhood are not accredited to the state in a recent pretentious work.

Under these circumstances it may not be amiss to amend the lists

as they appear, giving extension of range, and, in important cases, the localities.

Gaylussacia dumosa T. & G., in a bog at Nottingham.

Gaylussacia resinosa glaucocarpa Robinson, is more abundant in the coast towns of Rockingham county than the type; the fruit is larger, juicier, and more generally esteemed.

Crantzia lineata Nutt. Abundant about the Great Bay in the Squamscot River, Exeter, and at New Market.

Sanicula canadensis L. Seabrook and Kensington, among deciduous trees.

Rhus venenata D.C., is too common in many swamps.

Polygala cruciata L. Quite common on moist brackish grasslands, near the marsh. Seabrook, Hampton Falls and Hampton.

Baptisia tinctoria R. Br. Common in sandy woods near the coast.

Genista tinctoria L. This beautiful pest has been met with only at North Hampton, where it covers a space of about a square rod by the roadside. It is rapidly spreading.

Lespedeza procumbens Michx. Nottingham, N. H., a few plants only.

Lespedeza reticulata Pers. Kensington and Nottingham; sandy hills under deciduous forest.

Lespedeza polystachya Michx. Nottingham and Kensington, with the last.

Medicago Lupulina L. Not uncommon.

Medicago arabica All. Quite plentiful in a cultivated field at South Hampton. Not elsewhere observed.

Cassia nictitans and *Strophostyles* approach the line at Amesbury and may be expected in the state.

Two trees of *Acer platanoides* in a cemetery at Seabrook have started a numerous colony, but the saplings are not allowed to thrive. The seeds are spread broadcast by high northwest winds, and often travel one eighth of a mile, but as the soil is all cultivated none survive save in fence rows. Doubtless these will persist.

Seabrook, N. H.

CLEISTOGAMY IN LINARIA CANADENSIS.

J. R. Webster.

In August, 1898, I noticed at Milton, Mass., a plant of *Linaria Canadensis* that produced cleistogamous flowers only. In 1899, three

plants appeared within five or six feet of the spot where the first was seen. These were examined almost daily from April to October, and were seen to produce flowers abundantly, which were all cleistogamous. No other plants of this species were noticed in the neighborhood of these in either year. They grew in soil that was not very rich, and was composed of gravelly loam with a small addition of material from a peat meadow. They attained a height of twenty to twenty-four inches, developing branched racemes, some of which were a foot or more in length. Two of the plants branched from the bottom. They were exposed to the sun in the morning, but were shaded in the latter part of the day.

The closed corollas averaged about one-sixteenth of an inch in height and about one-twentieth of an inch in diameter at the base. They were closely contracted around the four anthers, and were compressed into a little knot at the top. The expanded bases of the filaments were confined within so small a circle that they coalesced, forming a small corona within the corolla. The corollas were white, with a faint blue tinge, slightly inclined to pink in the two or three cases in which a short spur was produced. Almost all the flowers were spurless. As soon as a corolla was pushed above its calyx by the growth of the ovary, it was separated from the latter and dropped. The flowers produced seeds.

Since my attention was first drawn to the occurrence of cleistogamous flowers in *Linaria Canadensis*, I have noticed them in racemes which bore also fully developed flowers on plants of this species growing in other localities. Mr. E. L. Rand, Mr. Walter Deane, and others have also noticed them. Several authors describe the plant as frequently having flowers with no corolla, or with a spurless corolla.

In Contributions from the U. S. Herbarium, Vol. III., No. 8, p. 517, Rydberg records from the Black Hills of South Dakota a form of this species: "Very slender and depauperate, apparently with cleistogamous flowers. The same form has also been collected in Nebraska by Rev. J. M. Bates, of Valentine."

Mr. T. S. Brandegee states in Zoe for June, 1900, p. 13, that he has noticed "a multitude of cleistogamous flowers on the lower part of the main and the whole length of the many side branches" of *L. Canadensis*, Dum., as it grows about San Diego.

Cambridge, Mass.

SOME UNDESCRIBED VARIETIES AND HYBRIDS OF CAREX.

M. L. Fernald.

In the course of recent studies of New England Carices five forms have been examined which differ so markedly from the described species as to merit special recognition.

Carex vestita, Willd., var **Kennedyi.** Pistillate spikes solitary or, if 2, closely approximate, the upper sometimes androgynous; staminate spike very short, overtopped by the pistillate. Near Silver Lake, Wilmington, Massachusetts, June 11, 1899 (*G. G. Kennedy*) A remarkable plant, on a casual examination seeming to have only pistillate spikes, and thus appearing very unlike typical *C. vestita* with its long, clavate, staminate spike.

C. maritima, Müll., var. **erectiuscula.** Spikes short, 1.25 to 1.75 cm. long, short-peduncled or subsessile, erect, not drooping, scattered or approximate: scales with shorter less conspicuous tips than in the species: perigynia smaller than in the ordinary American form, barely 3 mm. long. Cushing, Maine, July 10, 1888 (*F. S. Collins* in herb. C. W. Swan). An extreme form of the species parallel with C. *crinita*, vars. *minor* and *simulans.*

C. **lupulina × bullata.** Coarse as *C. lupulina*: pistillate spikes subtended by broad elongated bracts, solitary or 2, remote, sessile or short-peduncled, 3 to 5 cm. long, 3 cm. broad, mostly staminate at tip: perigynia firm as in *C. bullata*, but large and dull as in *C. lupulina*: principal staminate inflorescence peduncled; the peduncle about half as long as in *C. bullata*; the spikes numerous, as large as in *C. lupulina.* About small ponds in woods, Medford, Massachusetts, July 31, 1870 (*Wm. Boott*).

C. **retrorsa × utriculata.** Spikes and perigynia as in *C. utriculata*, but the perigynia mostly retrorse as in *C. retrorsa.* Connecticut, probably near Hartford (*C. Wright* in herb. C. W. Swan).

C. **virescens × arctata.** Slender and tall, 6 to 8 dm. high: leaves long and comparatively narrow (broadest 3 or 4 mm. wide), pubescent, especially on the sheaths: spikes slender, 2.5 to 5 cm. long, 2 to 2.5 mm. thick, mostly peduncled, ascending or spreading: perigynia as in *C. arctata*, minutely puberulent or glabrous. Wooded banks with both parents, Surry, New Hampshire, July 23, 1899 (*M. L. Fernald* in herb. Alstead School Nat. Hist. No. 242). Beautifully combin-

ing the characters of *C. virescens* and *C. arctata.* In foliage and pubescence like the former, but in inflorescence much nearer the latter species.

New or rare plants from Pownal, Vermont. — Pownal, which has furnished so many records of southern and western plants in Vermont, was visited the last of May, and a number of species new to the state were found.

Cornus florida, L., reported by Dr. J. W. Robbins in 1829, from Castleton, and since reported in other parts of southern Vermont, but unrepresented by herbarium specimens, was there collected.

Anemonella thalictroides, Spach, reported from "southern Vermont" in Perkins's Flora, was found growing abundantly with *Ranunculus hispidus,* Michx., about the hills of North Pownal. The latter species has undoubtedly been mistaken many times for *R. fascicularis,* Muhl.

Other noteworthy plants found at the same time were *Ranunculus bulbosus,* L., *R. abortivus eucyclus,* Fernald, *Antennaria petaloidea,* Fernald, *Taraxacum erythrospermum,* Andrz., *Anemone riparia,* Fernald, and *Polygonatum giganteum,* Dietrich. — W. W. Eggleston, Rutland, Vt.

[Prof. S. F. Clarke, of Williams College, writes that *Anemonella* has been known for some years at "Weeping Rocks" in Pownal. *Ranunculus hispidus* was recently found by Mr. Ralph Hoffmann at Stockbridge, Mass., its first station in the state. — Ed.]

SOME ORCHIDS OF EASTERN VERMONT.

Alice E. Bacon.

A section of the Connecticut valley, within a radius of four miles from Bradford, furnishes some fine specimens of Orchidaceæ, as well as other plants of great interest to the botanist. Less than a mile from the village is a swamp entirely covered at this season (June 25) with *Cypripedium spectabile,* and a little earlier fine specimens of *C. pubescens* and *C. parviflorum* were gathered there. This particular swamp is also a favorite visiting place for many kinds of birds. In the heart of the village, on a hill forming one of the banks of Wait's River, a small tributary to the Connecticut, is found an abundance of *C. acaule,* during the last of May.

About two miles south is a high cool peat bog, from which I have herbarium specimens of the following: *Microstylis monophyllos*, June 24; *Calopogon pulchellus*, July 8; *Pogonia ophioglossoides*, July 16; *Habenaria hyperborea*, July 8; *H. Hookeri*, June 26; *H. blephariglottis*, July 24. I have also had *Tipularia discolor*, but possess no herbarium specimen, nor do I of *Spiranthes Romanzoffiana*, which is also found in this bog. Here is also found plenty of *Sarracenia purpurea*, just now in full flower. On the way to this peat bog we pass through pine woods, where we find *Goodyera repens*, var. *ophioides* and *G. pubescens*, and also *Habenaria orbiculata*.

Three miles west, in a wet meadow, are *Spiranthes cernua*, Aug. 31; *Habenaria virescens*, June 24; *H. psycodes*, July 29, and *H. fimbriata*, July 7. A close examination of the peat bog above mentioned should, I think, show us *Liparis*, and one or two more species of *Habenaria*.

About ten miles from here is a large swamp of several acres, which is literally crowded with gigantic specimens of *Cypripedium spectabile;* it has been practically undisturbed for generations, being far from tourist routes, and known only to the country people as a species of *Valerian*, and a specific for nervous troubles. Several hundred stems were gathered last year without any perceptible effect on the mass; many of the flowers were double — that is, with two inflated lips to one calyx, and the stems were from 2 feet to 3 feet high.

I hope to add to the number of orchids already found here, as others, I feel confident, should be in this section.

Bradford, Vermont.

Baptisia australis in Vermont.— For nearly ten years *Baptisia australis*, R. Br., has been known to me on islands and alluvial banks of White river in Royalton. The plant occurs in three places, all within a distance of forty or fifty rods, and within half a mile of Royalton Centre. The island, where the plant once grew, has never been grassed over, but is composed of alluvial sands supporting willows, bush clover, dogbane, etc. Recently, I think, this station has been destroyed by the washing away of a portion of the Island. In this locality I have not failed, when I have looked for it, to find the Baptisia in the past eight years. I have not taken the opportunity to look above and below on White river, but should expect to find it

below, and perhaps by the Connecticut. I have supposed the plant to be a relic of cultivation, as it has been cultivated in Royalton, and the colony may have started from a place two miles above the present station. A small brook passes through the place and seed may easily have been conveyed by the brook to the river.

In 1890 I saw the plant in a cemetery lot one mile up river from the established station, and not far from the bank. But it is hardly possible that seed could have been carried thence by water agency. So far as I know it is not conspicuously spreading.— LEVI WILD, Franklin, Vt.

BOLETI COLLECTED AT ALSTEAD, N. H.

H. WEBSTER.

A STAY of five weeks in the hill town of Alstead, N. H., in July and August, 1899, repeated in 1900, has given opportunity for the collection of many fleshy fungi. Among them, and peculiar to the season, are numerous species of Boleti, on which, in view of the increasing attention given to these plants, a few notes may not be out of place. The collections were made by roadsides, on open and wooded hillsides, and in the hollows between the hills, usually in woods. Alstead Centre is in the northern part of Cheshire County six miles east from the Connecticut River, at an altitude of 1120 feet.

Since the seasons, both in 1899 and 1900, were unusually dry in the region, a large and continuous crop of fleshy fungi was not to be expected, and collections on the whole were rather meagre. Nevertheless, here and there a mossy slope, or a springy bank, or a mass of water-soaked decaying wood, held moisture enough to prevent the total non-appearance of the fungi naturally sought in such places; and well-shaded brooksides, swamps, and bogs were explored, not without success. Indeed the variety, if not the abundance of fleshy fungi was sufficient to keep interest unflaggingly alive, and to furnish material for constant study.

A word as to the treatment of the material collected may be suggestive to others similarly situated, especially if they would preserve Boleti. The process of drying, usually the stumbling block in the field, was as follows. In the first place a visit was made to the tinsmith, who

for a few dollars constructed a sheet iron box with shelves of wire netting. The dimensions of such a box may be adjusted to suit individual needs. A convenient size is four feet high by two feet square or less, with sliding shelves three inches apart. These should be of strong coarse wire netting, bound at the edges. Small squares of fine wire netting are convenient, also, for the reception of collections of small species. These can be laid on the shelves. The box is without a top and without a bottom, with a door in front, where it is held from collapsing by bands of sheet iron above and below the door. At the very bottom holes around the sides admit air. A kerosene stove completes the equipment. The height of this determines the position of the lowest shelf, on which it is well to lay a small plate of tin or glass, directly above the lamp, to distribute the heat. With this apparatus, the lamp with a low flame, relays of fungi may be conveniently dried; a lot put in in the evening will dry in the course of the night. When dry they may be allowed to accumulate on driers heaped on floor or table until a misty or rainy atmosphere renders them flexible enough to be put to press. Some five hundred collections were treated successfully in this way in five weeks in 1900. It seems probable that a portable drying box of the kind described, that could be arranged to fold or clamp at the corners, might easily be made.

Among the fleshy fungi, properly so called, collected at Alstead, the Boleti are prominent, as was to be expected, in a number of species. The following list, with notes, will show what it was possible to find among the hills of New Hampshire in a dry season.

It is natural, of course, to find *Boletinus pictus* Peck in every sphagnum bog, and on the mossy hummocks in wet woods, especially where there is abundance of decayed wood. It appears in Alstead at least as early as July 4, and probably earlier. Occasionally a rotten log may be found bearing a half dozen fruits in various stages, when the mycelial strands may be disclosed by tearing the log to pieces. All specimens examined had the solid stem and the dark red color required by the author's description, but were slightly umbonate. As found about Boston the species appears closer to *B. cavipes* Kalch., for the stem is usually hollow at the base, although the color is not that ascribed to the latter species.

Boletinus porosus (Berk.) Peck is occasional, but *B. paluster* Peck has not yet been found. It has been collected at Centre Harbor by Mr. C. F. Grover.

Of the viscid Boleti only a few species occur so early in the season. *Boletus Americanus* Peck has been repeatedly collected. Reports of it are not infrequently to be referred to *Boletinus pictus*, which in its late stages loses most of its tomentum and appears very yellow. *B. albus* Peck has occurred several times in open woods, and *B. granulatus* L. more often, though not in its autumnal abundance. One or two specimens intermediate between the two, but inclining towards *B. albus* suggest the close affinity of the two species. I have generally found, however, that in *B. albus* the pileus is small in comparison with the length of the stem.

The only other members of the section Viscipelles so far found about Alstead are *B. rubinellus* Peck, and *B. piperatus* Bull, two species which hardly show any viscidity, except in wet weather. The former grows in small quantity in two or three localities, one of which is in mixed woods, and another on an open hillside in moss just at the edge of a hemlock grove; one or two plants grew on decayed wood. Although at first glance much like *B. piperatus*, especially when the pores have become brown, the red and yellow tints of pileus and stem easily distinguish *B. rubinellus*. In its young state its coloring is most attractive, the comparatively large pores and often the upper part of the stem being of a peculiar red — almost Indian red in one instance. With the ripening of the spores this striking tint disappears from the tubes. Some dried specimens still retain a trace of it, and preserve the red and the marginal yellow of the pileus remarkably well. In the dozen or more specimens found, the stem was yellow at the base as in *B. piperatus*, and with yellow flesh; it was minutely flocculose above, and fibrous striate below. The yellowish white flesh of the pileus generally showed a faint band of pink near the pores. The dimensions of the spores were 13½ by 3½ μ, or a little more [12½ to 15 by 4, Peck]. Mature plants were found on July 21, 1899, and somewhat younger ones on July 18, 1900. Whether it will continue to appear at about that date remains to be seen, but it is not improbable that it may always be fairly prompt to date, like some other species, whose limited occurrence both in place and time is in such strong contrast with such plants as *B. scaber*, *B. subtomentosus*, and even *B. piperatus*. The last species is fairly abundant along roadsides and in woods, from the middle of July, or earlier, well into August, and probably later. In dried condition its resemblance to the browner forms of *B. rubinellus* is close. The determination of *B. rubinellus* was kindly confirmed by Mr. Peck.

Of the pruinose and subtomentose boleti, five species out of six or eight found, are easily recognizable. *B. miniato-olivaceus* Frost var. *sensibilis* Peck seems less common than about Boston, certainly not common enough to suggest the dangerous experiment of eating it.[1] It may be remarked, however, that the writer has eaten fresh young specimens of this Boletus (the pores removed) without any other than pleasurable results. Boleti even more than other fungi demand to be eaten as soon as gathered.

B. bicolor Peck, in exact agreement with the author's description, was found under a hemlock on a hillside on July 21, 1899. Its small pores and red stem are conspicuous even in the dried state.

The Boletus that has been found in greatest quantity about Alstead is one that I have referred to *B. subglabripes* Peck. It agrees well with the author's figure in Report 51 of the New York State Museum, and with the description, except that the flesh is usually pale-yellowish or yellowish-white, and the branny particles on the stem, in carefully handled specimens, can hardly be overlooked. Sometimes, a reddish tint appears on the lower part of stem at maturity. The color of the pileus is, in general, dead-leaf brown, with occasional chestnut tints in the pale-yellow color of pores and stem ; and in other points, including the dimensions of the olivaceous spores (12½ to 15 by 4 to 5μ, Peck), it agrees well with the description, although the average size of the spores appears to be about 13 by 3½ μ. This Boletus is conspicuous about Alstead by reason of its abundance, and its repeated appearance in woods and along wooded roadsides in July and early August. It has several times been gathered in sufficient quantity to furnish a dish at table, and can be recommended to those who like Boleti. Certain specimens are somewhat pitted or corrugated (var. *corrugis* Peck). This determination has been approved by Mr. Peck.

Of *B. chrysenteron* Fr. a few doubtful specimens have been collected, referred here because of their yellow flesh.

B. subtomentosus L., is common and extremely variable. The points relied on for recognition have been the soft, strongly tomentose pileus, the long, large, depressed, but often decurrent pores, the ribs on the upper part of the stem, the unchanging pale flesh, and the *yellow mycelial strands* at the base of the stem, which is sometimes reddish within.

The Calopodes are so far represented at Alstead by *B. ornatipes*

[1] See Rhodora, 1 : 2, pp. 21 — 23, Feb. 1899.

Peck, which is rather frequent towards the end of July, and by *B. pachypus*, Fr. which has been found twice. The former species, with its prevailing yellow color under a brownish pileus, and strongly reticulate stem, is familiar. The specimens referred to *B. pachypus* are few and somewhat doubtful, still they will go nowhere else. In general they agree well with the description; but the stem is not particularly thick, and the spores are of the usual Boletus type, and not ovate. Their dimensions are 14 by 4 μ (14 by 6 Massee, 12½ to 13¼ by 5 to 6 Peck). More material is needed to confirm this record.

Three species on the list are referable to the Edules. The first of these, *B. separans* Peck, occurs here and there, one or two plants at a time, in July and later, and is generally thick-stemmed and much injured by insects. The brownish-red of the pileus, with often a yellow margin, the lilac tints of the young buttons, and the tendency of the pores to separate from the stem, are fairly constant characters.

Most worthy of note is *B. eximius* Peck. No firmer, heavier Boletus can be found, nor any more instantly recognizable. Its purplish-brown pileus, dark pores, and dark, hard, furfuraceous stem, distinguish it at once. The tubes, it may be noted, are dull ochraceous or pale dead-leaf color, and in a vertical section contrast with the grayish or grayish-purple flesh. This Boletus, which seems not to be frequently collected, occurs sparingly at Alstead in July and August. A fine group of them was found on July 22, 1900, and being unusually free from insects, was welcome as herbarium material.

Boletus affinis Peck, has been collected several times, but rarely in condition for preservation. It is usually very soft, and succumbs quickly to moisture, heat, and insects.

With the exception of one imperfect specimen, very doubtfully referred to *B. Satanas* Lenz, and one specimen which is either *B. alveolatus* B. & C., as described by Frost, or more probably *B. Frostii* Russell, the Luridi are represented only by *B. luridus* Schaeff, in various pale forms. Typical *B. luridus* has been found once. In the specimens met with orange generally took the place of red, and the pores were hardly vermillion. Other characters were good.

The single specimen referred to *B. Frostii* is shining blood-red, with a somewhat uneven pore surface, and flesh which changed to blue. The reticulations of the stem are distinct, and the color strong, but there is no great roughness or raggedness of surface, as in specimens frequently collected in eastern Massachusetts.

The three common species of the section Versipelles are common also at Alstead, the most frequent being, of course, *B. scaber* Fr., which, much to the annoyance of driving parties, has always to be investigated along roadsides, lest something more interesting may be overlooked. There are always exciting possibilities about a glimpsed Boletus. *B. versipellis* Fr. is less frequent, but common enough to earn the neglect of collectors. *B. chromapes* Frost, on the other hand, partly from the attractive contrast of the pink of the pileus and the yellow of the stem, and partly because it occurs less frequently than expected, has usually been brought in when found. It begins to appear late in July.

Two species of Hyporhodii have been collected, *B. gracilis* Peck, which is not common, and *B. felleus* Bull. which is. There is little to be said of either. *B. felleus*, however, is not so large as I am accustomed to see it. A small form of it is not infrequent on stumps, presumably of hemlock, as noted by Peck.

B. cyanescens Bull. and *B. castaneus* Bull. represent the Cariosi, neither of them frequent so far as seen.

Since the preceding account was in type, a few more forms deserving notice have been collected. One of these is plainly referable to *B. badius* Fr., although the viscid cap is hardly shining when dry, and the flesh shows no blue, but after a time a pinkish tint. The stem is somewhat lined and finely brown-punctate. It agrees almost exactly with the figure in Michael's Führer für Pilzfreunde, a little book whose excellent colored plates ought to be better known. *B. affinis* Peck is sometimes confounded with *B. badius*, but is a much softer species, with flesh that usually turns yellowish, and pores that show bright ochraceous tints, whereas those of *B. badius* turn promptly to green when wounded.

A single specimen, which can be only *B. griseus* Frost, was found July 28, 1900, on a drive to Keene. The grayish cap, small white tubes, and beautifully reticulated whitish stem identify it, in spite of some discrepancy in its proportions.

Another single specimen, obtained on the same drive, is a form, akin to *B. luridus* which shows distinctly the characters ascribed to *B. erythropus* Pers. It has a long slender cylindrical stem, the flesh of which is red all through within. Its spores are large, 17 by 6½ μ.

Among many forms, which were at first placed with *B. luridus* one, which was sent to Mr. Peck, has been referred by him to *B. vermiculosus* Peck. The velvety pileus is brown, or yellowish brown; paler

towards the margin; the stem is similar in color, with a close scurfy covering, glabrous and somewhat yellow above, marked with raised lines as in *B. luridus*; the tubes are yellow with brown mouths; the yellow flesh and the tubes change almost instantly to blue. Its spores are "too small for *B. luridus*," being 10 to 11½ by 5 to 5½ μ.

In addition there is the usual remnant of isolated collections awaiting determination, the final disposal of which may increase the list. Specimens of all the species here mentioned are preserved in the herbarium of the Alstead School of Natural History, and many of them also in that of the Boston Mycological Club.

ORCHIDS OF MT. GREYLOCK, MASSACHUSETTS.

A. LeRoy Andrews.

Mt. Greylock, from its foremost position among the mountains of Massachusetts, and its recent promotion to the dignity of a State Reservation, assumes such an importance that a brief consideration of a few of its floral features may not be out of place. The mountain, situated in western Massachusetts, represents a detached spur of the Taconic system and forms an irregular mass several miles in length and breadth, with several peaks and various depressions and eroded valleys. On account of its great extent and its varied conditions of altitude, soil, drainage, and exposure it presents a flora of great interest and variety.

In point of distribution its Orchids especially furnish a study which well rewards investigation. We may conveniently divide the mountain surface into four sets of conditions, marked generally by pronounced floral distinctions, as follows: 1. Unwooded lower slopes including grassy pastures, springy meadows, narrow drainage valleys, etc. 2. Lower wooded slopes. 3. Upper wooded slopes. 4. Clearings, at various elevations, generally thickly overgrown with June grass, sometimes with blueberry bushes, ferns, etc.

In the first-mentioned localities, comparatively dry, steep, hillside pastures yield *Habenaria lacera* and *Spiranthes gracilis*, both very common species of this portion of Massachusetts. The more moist, level places furnish *S. latifolia* and *S. cernua*. Upon a steep bank with a colony of sundew grows *Habenaria tridentata*.

The areas referred to as the lower wooded slopes are possibly the richest in species and afford approximately in the order of ascent, *Orchis spectabilis*, *Cypripedium acaule*, *Habenaria Hookeri*, *Liparis liliifolia*, *Habenaria bracteata*, *H. hyperborea*, *Corallorhiza multiflora*, *Habenaria orbiculata*, and *Goodyera tesselata*.

While it is hard to draw a definite line between the lower and upper slopes the following distinction may generally be made, the lower are usually well drained by numerous brooks giving firmer and drier soil, while the forest growth is largely of deciduous species; the upper, on the other hand, are extremely wet and cold, and evergreen trees preponderate, particularly spruces and balsams. To the upper slopes belong *Microstylis monophyllos* with occasional specimens of *Corallorhiza innata*, the drier soil under spruce groves being carpeted with beautifully reticulated leaves of *Goodyera repens* var. *ophioides*. *Habenaria dilatata* is also reported here, probably correctly, though I have not yet seen it.

The clearings are characteristic, generally natural, and frequently of considerable extent. *Habenaria lacera* is unfailingly present, and, no matter how dry the soil or the summer, always makes an effort to unfold its flowers and develop its seed. As a good example of the pertinacity of this species, I found on a very small grass plot not far below the summit, at an elevation of something over three thousand feet, two specimens just coming into bloom, the date being the seventh of August, a month later than its date of flowering in the valleys below. The occurrence of *Microstylis ophioglossoides* in one of these dry, grass-covered meadows is noteworthy as so inconsistent with its usual habitat. It occurs, so far as I know, only in one place, but is there rather abundant and seems to thrive and bloom as well as in more congenial swampy localities, though it very seldom develops a seed-pod.

The above observations are based upon personal exploration of a portion of the mountain surface, and while not necessarily exhaustive, and probably admitting of exceptions and additions for other portions, may be taken as a fair statement of the general conditions of growth and distribution of Orchidaceae of Greylock Mountain.

Thetford Academy, Thetford, Vermont.

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THE FERNS OF ALSTEAD, NEW HAMPSHIRE.

HELEN M. NOYES.

FOR several weeks I have watched with interest the ferns occurring within a five-mile radius of the Alstead School of Natural History. Besides Alstead itself this region embraces portions of several other towns, though with few exceptions the species here enumerated have all been collected within the limits of Alstead township. Notwithstanding the fact that there is little or no limestone in the immediate vicinity of Alstead, the natural conditions of the region — naked and wooded hills, exposed and sheltered cliffs, upland and lowland woods and swamps — are favorable to the development of very many species, and the unusually complete representation of many genera has furnished a good opportunity for study. To those familiar with the limited region which I have examined, the following notes may be of interest, while to others they may furnish data for some profitable comparisons.

There is hardly a pasture or roadside, wet or dry, from which one does not get, as he walks or rides, the fragrance from the damp or almost viscid fronds of the sweet-scented fern, *Dicksonia pilosiuscula*. The stone walls marking the boundary lines of the hillside farms, and the boulders, often lodged in deep hollows, are banked on either side by beds of the delicate, minutely pubescent fronds; and where the walls or fences have been destroyed the boundaries are now marked by broad belts of Dicksonia. Wherever the plant grows, the fronds show a decided tendency to turn in one direction. Sometimes it seems that the fruit-bearing surfaces are all turned from the light. This characteristic is particularly noticeable where the fern grows in a ravine, with the intenser light entering from one direction. Other observers have remarked the tendency of the fronds to face the

prevailing wind of the region, and in evidence have pointed out large patches in the open where the light is essentially uniform from all directions.

Often mixed with the Dicksonia, but as frequently growing by itself, is the lady-fern, *Asplenium Filix-fœmina*, easily distinguished from the other by its stouter, smoother, and more succulent fronds. Along the roadsides and in open places the fronds are now (early August) brownish and straggling from the weight of the fruit; but in spite of the unattractive appearance of this fern, its soil variations are striking and exceedingly baffling. I find it difficult to reconcile as forms of the same species the plant of the dry roadsides and of the wooded swamp not a hundred yards away; yet the diverse forms are so numerous and inconstant that it seems almost hopeless to attempt any definite characterization of them.

In rich, shaded soil, especially in alluvium, I have occasionally found the rarer *Asplenium thelypteroides*. In order to distinguish this fern, at first sight, from the ostrich-fern, one must have a long acquaintance with the plant. In the ostrich-fern, however, the pinnae are firmer, more crowded and more over-lapping than in the more herbaceous frond of the Asplenium; and, furthermore, if the Asplenium is in fruit all doubt as to its identity will be removed, for an examination of the under side of the frond will reveal the elongated fruit dots characteristic of the genus.

Other representatives of this genus here are *Asplenium ebeneum* and *A. Trichomanes*, often found side by side on shaded, moss-grown rocks. The ebony fern, *A. ebeneum*, is the taller and more upright of the two plants, with a smooth, stout, black stipe and rhachis, while *A. Trichomanes*, the smaller of the two, occurs in dense spreading tufts, a few green fronds often rising from a mass of dead, brown stems, the remnants from many previous years.

Most interesting to me of the Alstead Aspleniums is a bed of *A. angustifolium*, at what may be its easternmost station. The only patch found was by the course of a spring brook, in rich, alluvial woods near the Cold River, only a few miles from its junction with the Connecticut. So closely did the plant resemble, at first sight, the Christmas fern, that it was not until I had passed my hand over the fronds and examined them more carefully that I noticed the difference. The fronds are longer and more spreading, and of such delicate texture that they wilt as quickly as the maiden-hair, *Adiantum pedatum*, a

plant which abounds here as in all the rich woods of western Cheshire County. At this time, early in August, the fruiting fronds of the Asplenium, with elongated, crowded dots, are just appearing.

On a shaded hillside I have once found fruiting fronds of the brake, *Pteris aquilina*, a plant common in every clearing, but, in my experience, rarely fruiting. Nor have I seen the plant so tall and broad as here in the woods, where the fruiting plants are conspicuous by their more straggling-branched appearance, caused by the infolding of the margins to cover the spore-cases.

In a few places the rock-fern, *Polypodium vulgare*, covers the ledges. In the shade the fronds are long and green, while in the sun they are stunted and yellowish; but nowhere here have I seen the plant in such abundance as in eastern Massachusetts.

The two common species of *Phegopteris*, *P. polypodioides* and *P. Dryopteris*, are seen in their respective habitats. Beds of the former are growing in the lee of many dry banks. The fronds are triangular in shape, peculiarly roughened, and almost, if not quite, invariably the two lower pinnae are pushed forward and upward from the rest. I have searched carefully for the broader fronds of *P. hexagonoptera*, but evidently it is not found in this immediate vicinity. *P. Dryopteris*, with its more delicate, thrice-divided fronds, spreads in waving carpets over large areas of damp woods.

I am most pleased that this year the Aspidiums have been spread before me for study as never before, — for I found some time since that the secret of careful determination lies in careful comparison. *Aspidium noveboracense*, with its pale fronds attenuated at base, here, as in all New England, is frequent in the borders of woods, while in the deeper shade is the common *A. spinulosum* var. *intermedium*. The low, light-green fronds of *A. Thelypteris* had often attracted my attention in the meadows and swamps, but in the alluvial soil of Cold River I was surprised to find the sterile fronds two feet high, while the more slender, fruiting fronds were even taller.

Aspidium cristatum, one of the evergreen ferns, I see frequently in swamps, where its fertile fronds, with large, closely-crowded fruit-dots, are now mature. On the hillsides, *A. marginale* appears in characteristic form. The fronds rise symmetrically from the crown, the fertile ones often falling heavily back, some of them borne quite to the ground by the weight of the large, marginal fruit-dots.

Another evergreen, striking by virtue of its shining fronds, is the

Christmas fern, *Aspidium acrostichoides*, in texture resembling *Polypodium vulgare*, but with the fronds longer and more deeply cut. On the slope of Fall Mountain, in Walpole, I found a single clump of the variety *incisum*, with the pinnae curiously cut and crisped, but hardly so attractive as in the type.

The Woodsias are represented here by two species. *W. Ilvensis* is found in patches on exposed rocks and cliffs. As the elevation and exposure to sunlight increase the plant becomes very stunted and chaffy, but in shaded places the green fronds rival in length those of its scarcer relative, *W. obtusa*. The latter species has thus far been found only on the slopes of Fall Mountain, but there it grows on an earthy bank with *Cystopteris fragilis*, a species which loves best the dripping, shaded rocks by streams.

All three of the Osmundas grow here. The flowering fern, *O. regalis*, with only the tips fertile, is stunted and yellow in dry soil, but tall and green in the swamps. The interrupted fern, *O. Claytoniana*, is more frequent here than the cinnamon fern, *O. cinnamomea*, and it apparently fruits somewhat later. The sterile fronds of these two species are not readily separated at a glance, but in the cinnamon fern there is a tuft of wool at the base of each pinna, while the pinnae of the interrupted fern are naked at base.

I came from a region where one plant of the ostrich fern, *Onoclea Struthiopteris*, was a carefully protected garden treasure, and, naturally, it has been a constant revelation to me to see, even along the roadsides, the rank profusion of this splendid fern. It is in the alluvial soil of the river banks, however, that the plants become tropical in their size and royal bearing. On the deep, black alluvium near the Connecticut I found one day half an acre of these ferns. The great crowns, with the slightly overlapping fronds, rose to the height of several feet, and it seemed a pity to brush through such a luxuriant growth. Each frond is a perfect production in itself, in form like the feather from which it so aptly takes its name. From the centre of the crown come the thick, twisted fruiting fronds. These are not generally found; but even more of a surprise was the discovery by one member of the school who found, in place of fruiting fronds, a nest of the Maryland yellow-throat — truly a royal home for the young songsters.

Growing beside these plants, — indeed often mingling with them — are the broad, more herbaceous fronds of the sensitive fern, *Onoclea*

sensibilis. Here in the deep soil its fronds greatly exceed in size those which we ordinarily see in the meadows, and they appear like the basal leaves of some flowering plant. When the first frosts of autumn come the sterile fronds blacken and shrivel, and only the stiff fruiting fronds remain, brown and torn.

My attention has been drawn, likewise, to a group of fern-allies, the *Ophioglossaceae*, which here present a very fair display of species. Within a mile of the school I find four species of *Botrychium*, the moonwort. *B. virginianum* is most common, its platform-like sterile portion often a foot and a half wide, most exquisitely cut, and, with the long-peduncled fruiting frond, raised high above the other herbaceous vegetation of the dry woods. Not so attractive a plant, but one fully as interesting to find, is *B. matricariaefolium*, which occurs frequently among the leaves under deciduous trees. Its sterile pinnae are small, but coarse and of thick texture, the fruiting portion being the conspicuous part of the plant. Not far from this species, but mostly among pine needles, I found, by searching on hands and knees, the tiny plants of *B. lanceolatum*. In some places only the fruiting tips appeared, while below, half covered, were the finely-cut sterile pinnae. So frail are these two species that I was moved by an impulse to tiptoe over the pine needles least I should crush one plant.

Botrychium ternatum, with its many varieties, does not appear so commonly in this region as in localities near Boston. A single form has thus far been noted, the variety *intermedium*, which rarely grows in open pasture lands.

One hot morning, after studying the plate in Gray's Manual, I hunted in a sunny meadow for the adder's-tongue, *Ophioglossum vulgatum*, and for some time the closest search did not reveal the smooth, oval leaf and the uncanny green fruit-stalk. But when I discovered at first one, then another, and another, among the tall meadow grass, my delight was keen indeed. Further exploration has shown the plant to be not uncommon in meadows and damp fields, where its characteristic yellow roots are deeply buried in the sod.

Alstead School of Natural History.
Alstead Centre, N. H.

A CLUSTER-CUP FUNGUS ON LESPEDEZA IN NEW ENGLAND.

A. B. Seymour.

The Cluster-cup fungus, *Aecidium leucostictum*, growing on leaves of various species of *Lespedeza*, was first mentioned as occurring in North Carolina, being listed in Curtis's Catalogue of the plants of that state. It has since been found in southern Illinois (Seymour) on *Lespedeza repens*, in Canada (Dearness) on *L. capitata*, and in Alabama (Earle). It was first described in Grevillea 3:61. December 1874, by Berkeley as *Aecidium Orobi* var. *leucostictum* and again in Bull. Ill. Lab. **2** : 226. 1885. There it is well considered a distinct species as named above.

It has never been reported within five hundred miles of Boston till now. On the twentieth of July, 1900, I found it fairly abundant in several localities on *Lespedeza hirta* near Shoot-flying hill, about five miles west of Hyannis, Mass., on the western end of Cape Cod. The Canada specimens were also collected in July, but the southern Illinois specimens in May.

The plant is easily detected by the pale but clear yellow spots which occur on the upper surface of the leaf, opposite the cluster-cups, and are about 2 mm. in diameter.

The cups are small, very inconspicuous and in clusters of about twenty-five, scattered or arranged in minute "fairy rings."

The question now arises, what is the teleutosporic rust-form of this fungus. If it is a heteroecious species, like wheat-rust, which grows at one stage on barberry and at another on wheat, the teleutosporic stage must occur on some plant of wide distribution. If, however, the fungus is autoecious, producing teleutospores on the same host plant, are the teleutospores known as such, or do they remain to be discovered? Among known forms, the only one which suggests itself is *Uromyces Lespedezae*. This has both uredo and teleutospores known and is abundant on various species of *Lespedeza*. It is very common and widely distributed. If *Aecidium leucostictum* is correspondingly abundant, it must be generally overlooked.

Whatever its affinities, there is no apparent reason why it may not be found elsewhere in New England.

Cambridge, Mass.

THE DISTRIBUTION OF THE BILBERRIES IN NEW ENGLAND.

M. L. FERNALD.

WHILE walking late in June in open pine woods near York Village, Maine, the writer was greatly surprised to find, among low junipers and other shrubs, a patch of dwarf bilberry, *Vaccinium caespitosum*. The bushes, somewhat hidden by juniper, arrow-wood (*Viburnum dentatum*), and black cherry (*Prunus serotina*), covered an area about twelve feet square, and were fruiting abundantly. Little time was devoted to further search, and no other colonies of the plant were seen; but the uniform character of the large tract of woods suggests that the plant may not be restricted to the small area noted.

The special interest of this recently discovered colony at York lies not alone in the fact that this is the southernmost known station for the plant in eastern America, but chiefly in the striking circumstance that, as ordinarily known to New England botanists, *Vaccinium caespitosum* is a plant of the highest alpine summits. On the mountains, furthermore, the dwarf bilberry is not, like the related *V. uliginosum*, of general distribution. While the latter abounds everywhere above timber-line on the New England and Canadian mountains, the former (*V. caespitosum*) is generally confined to extremely limited areas near the summits of a few peaks. In the Quebec mountains it is known only at the summit of Mt. Albert in Gaspé; on the highest peaks of New Brunswick *V. uliginosum* alone is found; as a mountain-plant in Maine *V. caespitosum* is known only from two peaks, — Ktaadn, and at the pinnacle (4,450 feet) on Saddleback, near Rangeley Lake; in the White Mountains it occurs on the summits of Washington, Monroe, Moosilauke, and probably Lafayette, but it is rare or unknown on the other peaks; in Vermont it is found as an alpine species on Mt. Mansfield; and in the Adirondacks it occurs on the summits of Mts. Marcy and Whiteface.

Growing thus with *Diapensia lapponica* and other arctic-alpine species upon the highest peaks of northern New England, New York, and Canada, *Vaccinium caespitosum* would naturally be expected, like them, in arctic and subarctic portions of eastern America. Although it is said in the Synoptical Flora to grow on Hudson Bay, no authentic record of it can be found from north of Hamilton river (latitude 53°–54° N.); and recent explorers have seen it on the Labrador

coast only as far north as Chateau Bay (lat. 52°). Furthermore, *Vaccinium caespitosum* is a species unique to North America, not of broad range in the northern hemisphere like most of the arctic-alpine species of New England. If, like them, it occurred in arctic America, we should expect to find it in northern Europe as well.[1] But, as stated, there is no evidence that the dwarf bilberry is an arctic species, nor does it occur in Europe.

In New England and adjacent Canada, furthermore, the plant is by no means confined to the alpine summits. In Vermont it has been found on the banks of the West River at an altitude of not more than 400 feet (Rhodora, ii. 88). Among the White Mountains it is known from a few valley stations, — for example, by Moose river in Randolph, where it is said never to fruit, and in a pasture at Jackson. In Maine the writer has found it at low altitudes in many sections. The York station recently discovered has been already mentioned. This, the most southern known colony of the shrub, is within the limits of a town where *Sagina nodosa*, *Potentilla litoralis*, *P. tridentata*, *Plantago maritima*, and other far-northern species are known. But these plants are all on rocky banks or cliffs near the sea, where the conditions are not unfavorable to arctic species. The *Vaccinium*, on the other hand, grows with huckleberries (*Gaylussacia resinosa*), columbine (*Aquilegia canadensis*), Lecheas, Helianthemums, and other plants of southern range, in dry open woods, nearly or quite three-fourths of a mile from the sea.

With the exception of the York station (latitude 43° 8′), the dwarf bilberry is as yet unknown in Maine south of latitude 44° 50′. In the valley of the Kennebec it occurs on sheltered rocky banks at Madison, and from there northward is not uncommon, — as often on sunny hillsides as on sheltered banks. In the Carrabassett valley the shrub is found on sandy knolls near West Embden, and at New Portland it is abundant on the river bank. In the valley of the Sandy river it has been seen only by the river in Phillips, but no other locality has been searched for it. In the valleys of the Penobscot and its tributaries, the Piscataquis, the Mattawamkeag, and the Wassataquoik, the plant is to be found on almost any ledgy or gravelly river-bank from Orono northward, and not infrequently the shrub abounds on dry sunny slopes. In fact, the " Sugar Loaf " in Orono, a hot sandy

[1] For discussion of such distribution, see Rhodora, ii. 38.

hill where the dwarf bilberry thrives, is the northernmost station in Maine for the southern species, *Polygala polygama* and *Corylus americana*. In the valley of the upper St. John, however, from the mouth of the Madawaska river westward, *Vaccinium caespitosum* reaches its greatest development in Maine. There it is one of the common blueberries, covering acres of gravelly shore and hillside pasture. The fruit is gathered as "Indian blueberry"; though, on account of its habit — the berries solitary or few, and drooping from the axils — it is less easily picked than the equally common *V. canadense.*

Little is known of the distribution of *Vaccinium caespitosum* in New Brunswick, save in the St. John valley, but further exploration will doubtless show it to be as frequent there as in Maine. There are many large areas in Maine, too, where the plant has not been noted, as the thickly populated section between the Sandy river and York. Here, as in New Hampshire and Vermont, the species is probably much more common than has been supposed. The comparative insignificance of the shrub, — rarely a foot high, and with drooping flowers and fruits hidden by the leaves, — as well as the prejudiced opinion that it should be looked for only upon alpine summits, has tended to keep the plant an unknown species in regions where it may abound. At any rate, its comparative frequency throughout Maine, from latitude 44° 50′ northward, and its absence from Labrador, north of Chateau Bay and Hamilton river (latitude 54°), are sufficient evidence that the dwarf bilberry is a boreal or Canadian plant, though of rather limited distribution in the East. Its occurrence on the alpine summits of a few mountains, and not on the lower treeless slopes, is not readily explained; but that several common species of our lowland woods — the bunchberry, *Cornus canadensis*, etc., — thrive upon the alpine summits with *Diapensia*, *Cassiope*, and *Bryanthus*, is a fact well known to all students of the New England mountain flora. *Vaccinium caespitosum*, then a plant of somewhat extended lowland range, should be classed, apparently, with *Cornus canadensis*, rather than with the arctic-alpine *Diapensia*, *Cassiope*, and *Bryanthus* which, in our latitude, cling exclusively to the alpine peaks.

With the common mountain bilberry, *Vaccinium uliginosum*, the case is quite different. This species, as already stated, abounds above timber-line on practically all the higher mountains of New England, sometimes on peaks of scarcely 2,000 feet altitude. It is in no sense confined merely to the "pinnacles," as is the tendency with

V. caespitosum, but it covers acres of ledgy slopes. Unlike the latter species, however, the mountain bilberry rarely grows at low altitudes. In Maine only three such stations are known, — a dry hillside in Farmington, a ledgy shore of the Carrabassett in Jerusalem (in the valley between Mt. Abraham and Mt. Bigelow), and Fort Kent on the upper St. John, where it is reported by Miss Furbish (see Rhodora, i. 172). In New Hampshire it rarely descends to the valleys, as in Franconia Notch; and in Vermont a single lowland station is recorded, on the bank of Lamoille river in the Green Mountains (Rhodora, ii. 88). Thus, although of very general distribution on the mountain summits of New England, the mountain bilberry as a lowland species is very exceptional.

In its broad range, *Vaccinium uliginosum* occurs throughout the circumpolar regions of the northern hemisphere, and it is one of the chief sources of food among northern races. It is very decidedly an arctic-alpine species, though not of such restricted distribution on our mountains as the arctic *Diapensia*, *Cassiope*, etc. Why this shrub, which abounds in polar regions, should thrive just above timber-line on so many of our mountains, while *Vaccinium caespitosum*, a lowland species, which is unknown north of latitude 54°, clings, when it ascends the mountains, to the most exposed summits, is more easily asked than answered. That this seemingly anomalous condition exists there can be no doubt, but for its final explanation we must await further investigation.

A remarkable development of *Steironema lanceolatum*. — A form of *Steironema lanceolatum* which was exhibited at Horticultural Hall last summer was the subject of much discussion. The plant was found in Holbrook, on the banks of a ditch, in a meadow. It has since been found in a second locality from the first, so that it cannot be regarded as an abnormal development. The plant is remarkable in that the stems trail along the ground *for a distance of five or six feet*, rooting at intervals in the mud. In this it resembles the southern *S. radicans*, but specimens compared at the Gray Herbarium show it to have the foliage, inflorescence, and calyx of *S. lanceolatum*. — Alice L. Grinnell, Holbrook, Mass.

AN AFTERNOON OUTING FOR TOADSTOOLS.

H. Webster.

The rainy days of the second week in August were just in time to revive the sinking hopes of the constant few among the members of the Boston Mycological Club, who had been striving, despite the parching drought of July, to find toadstools enough to maintain the interest of the regular Saturday exhibitions at Horticultural Hall. They had almost given up their efforts, which had been rewarded by only a few of the commonest species, so often exhibited that visitors to the exhibitions began to tire of them. Memories of moister seasons of a few years ago, when the last week of July saw the tables gay with seventy-five to a hundred species, seemed unreal, and unreliable as a basis for present expectation. For such is the way with the fleshy fungi. Given moisture, they fruit abundantly; denied it, they fruit stingily or not at all, and leave us to wait perhaps until the year comes round again for a sight of the full range of species.

Coming from the New Hampshire hills, where, in spite of lack of rain, toadstools had been gathered in great variety, if not in great abundance, some of us were unwilling to accept the prevalent attitude of discouragement. Inviting, therefore, a despairing friend or two, we started on the afternoon of August tenth, with the mercury in the nineties, for the Blue Hill region.

Though formerly somewhat inaccessible, except about Blue Hill itself, this region is now opened to visitors in its eastern extent by the electric railroad, which, leaving the Neponset River at Milton Lower Mills, passes up Randolph Avenue directly through the heart of the Metropolitan Reservation, between Chickatawbut and Hancock Hills. At various points along the line the fungus hunter may find good collecting, for there are numerous low slopes and hollows that are moist at almost any time, and the swamps and bogs lying south of the range, about Great Pond in Braintree, and to the east of Ponkapog, can be reached by a longer ride and in the latter case by a moderately long walk.

The higher stony ground, especially where tumbled boulders and broken rock lie exposed on southern slopes, should be avoided by timid explorers. For such places are inhabited or haunted by rattlesnakes, that still are numerous enough to make a word of caution necessary. Though numbers of these reptiles are killed every year, they still thrive in limited areas, and the chance of meeting a strag-

gler, who has perhaps come down to low ground for water, or for a frog or two, is still to be reckoned with. Twice within the last few years I have met a rattlesnake in the region about Chickatawbut hill; in neither case, however, was there really any danger, and in neither case did the snake survive the encounter.

On this hot August afternoon our party left Milton about two o'clock. In twenty minutes or so we were to all appearances far in the country. Resisting the temptation to alight and take the empty one-horse "barge" or "team" that stood waiting above Tucker's hill to take us or any one to Houghton's Pond — south of which, it may be noted, stretches a broad extent of low ground, well wooded, to Ponkapog Pond, a region that usually well repays a visit — we rode on to the nameless point that marks the limit of the first five-cent fare.

Striking into the young, hard-wood growth on the east of the road we began, though on unpromising ground, to find toadstools immediately. The first species to be seen was *Lactarius volemus*, common enough, but always interesting in the woods. Some of the older specimens had the margins turned up, showing the gills, and the surface of the pileus was much cracked. Near by was a single large specimen of Peck's *Lactarius corrugis*, allowing an instructive comparison of the two species, which are very closely related. The latter, as its author says, is darker, and characterized by the variously wrinkled pruinose-pubescent pileus. It is fairly abundant in rather dry deciduous woods in a few places in the Reservation. More conspicuous than the Lactarii was *Boletus alveolatus*, numerous fruits of which thrust their shiny red caps well above the leaves, some of which, however, stuck fast to the viscid surface. Though not well known farther north, this red Boletus, with its rough, lacerated, red and yellow stem, covered with a raised network of coarse, stiff ridges, is familiar in woods about Boston, and is not improbably common throughout eastern Massachusetts. The blood red of the young pileus gives place to some yellow in more mature fruits. The young pores, of a deep rich red, are frequently covered with drops of moisture. The flesh changes quickly to blue, and the pore surface is often irregularly pitted, characteristics which, with the very rough stem, identify the plant with that which Frost described as *Boletus alveolatus* B. & C. By that name it seems convenient to refer to it, pending a revision of the synonymy of this group of the genus. Associated with these interesting species were *Boletus chromapes*, always attractive by its

coloring, and *B. ornatipes*, which in the rough, coarse reticulations of its yellow stem vies with *B. alveolatus*.

Treating with scant attention a few dried-up specimens of the ubiquitous *Russula foetens*, and a single well-fruited *R. furcata*, and pausing a moment by a stump to gather one or two small fruits of *Cantharellus aurantiacus* of the pallid variety figured by Cooke, which seems to be the common form in the region, I hunted over the ground for the yellow form of *Amanita rubescens* and for Ravenel's Boletus, which I remembered seeing in that particular patch of woods three years ago. They were not there this time. In fact *Boletus Ravenelii* is so disappointingly rare about Boston that very few collectors know the beauty of it except by hearsay. Once seen, its exquisite, powdery yellow veil, that so long masks the tubes, and the contrast between the sulphur yellow of the stem and the dull red of the pileus linger in the memory and make one eager to find it again. Had there been time to reach a pine grove, we should also have sought its near relative, *B. hemichrysus*, whose dusty-looking, soft, tawny-golden pileus is so conspicuous on the trunk or at the base of a pine — when you can find it. I have collected it a mile or two to the east, in Quincy, and a damaged specimen from Canton or near there, turned up at the exhibition on the day following our excursion. All collectors should hunt carefully for these two Boleti in early August, and preserve and report those found.

Making our way back to the road through a tangled thicket covering boggy ground that would have been impassable dry-shod in an ordinary season, and picking up a handful of *Lactarius subdulcis*, another of *L. griseus*, which is not frequent hereabouts, and one or two pale specimens of *L. chrysorheus*, we passed to the other side and plunged into the shade of a bog that is less densely overgrown and usually very wet. Here were one or two Leptonias and Inocybes, dull colored and perplexing, and with them, always a joy to the eyes, Peck's *Entoloma cuspidatum*, a plant not rare about Boston, but collected only by those who insist on braving the mosquitoes and the wet of sphagnum bogs. To be fully appreciated, the pale yellow delicate fruits of this fungus, each tipped with an abrupt cusp, must be seen rearing their frail caps above the soft masses of sphagnum in which their stalks are buried. Were it not for an occasional hint of salmon on the mature gills, the thought that they are pink-spored would hardly occur to one.

Beyond the bog our objective point was a bit of moist ground higher up, where last year grew abundance of *Boletinus decipiens*. Careful search, however, failed to discover it, and perhaps we were too early, for August 16, was the date in 1899. *Boletus bicolor* was fruiting, a fungus very easily mistaken for *B. miniato-olivaceus* var. *sensibilis*, on account of its color, pink and yellow in the older specimens, its large, soft caps, and its odor, which to some suggests the smell of sulphur, to others that of hickory nuts. The red stem, yellow at the top, and the scarcely changing yellow flesh mark *B. bicolor*. The other with the long name, has a yellow stem and changes quickly to blue. Here also were two fruits of the anomalous *Paxillus paradoxus*, half agaric and half polypore, with soft red pileus and general suggestion of Boletus in tint and texture, and yellow fleshy lamellae with conspicuous transverse partitions, in this case less porous and so less like Boletinus than usual.

Warned by a rapidly darkening sky, and by approaching shocks of thunder, we cut short our search and hurried back to the road, where we found shelter from the shower that speedily followed. Satisfied that we had demonstrated the existence of toadstools even in a dry, hot season, we were content to let the homeward car carry us within a few rods of a wooded hill where we might have found *Lactarius luteolus*, *Craterellus Cantharellus*, *Boletus Peckii*, *Cantharellus minor*, and *Cyclomyces Greenii*, all of which have been collected there, and perhaps were waiting for us as we passed. At a quarter to six we were back again on sterile Boston pavements.

Plantago elongata in Rhode Island. — In the July number of Rhodora I observe a brief communication on the occurrence of *Plantago elongata* Pursh, or properly, as it seems to me, following the unbroken usage of over fifty years, *P. pusilla* Nutt.

About 1871 I found the plant along the highway leading from East Greenwich, Rhode Island, to the famous forge of General Greene. About a quarter of a mile north of the forge, the road passed over a sort of gravelly common, where it was quite abundant.

A year or two afterwards I found it about half a mile south of East Greenwich, on the road to Hunt's bridge. — J. W. Congdon, Mariposa, Cal.

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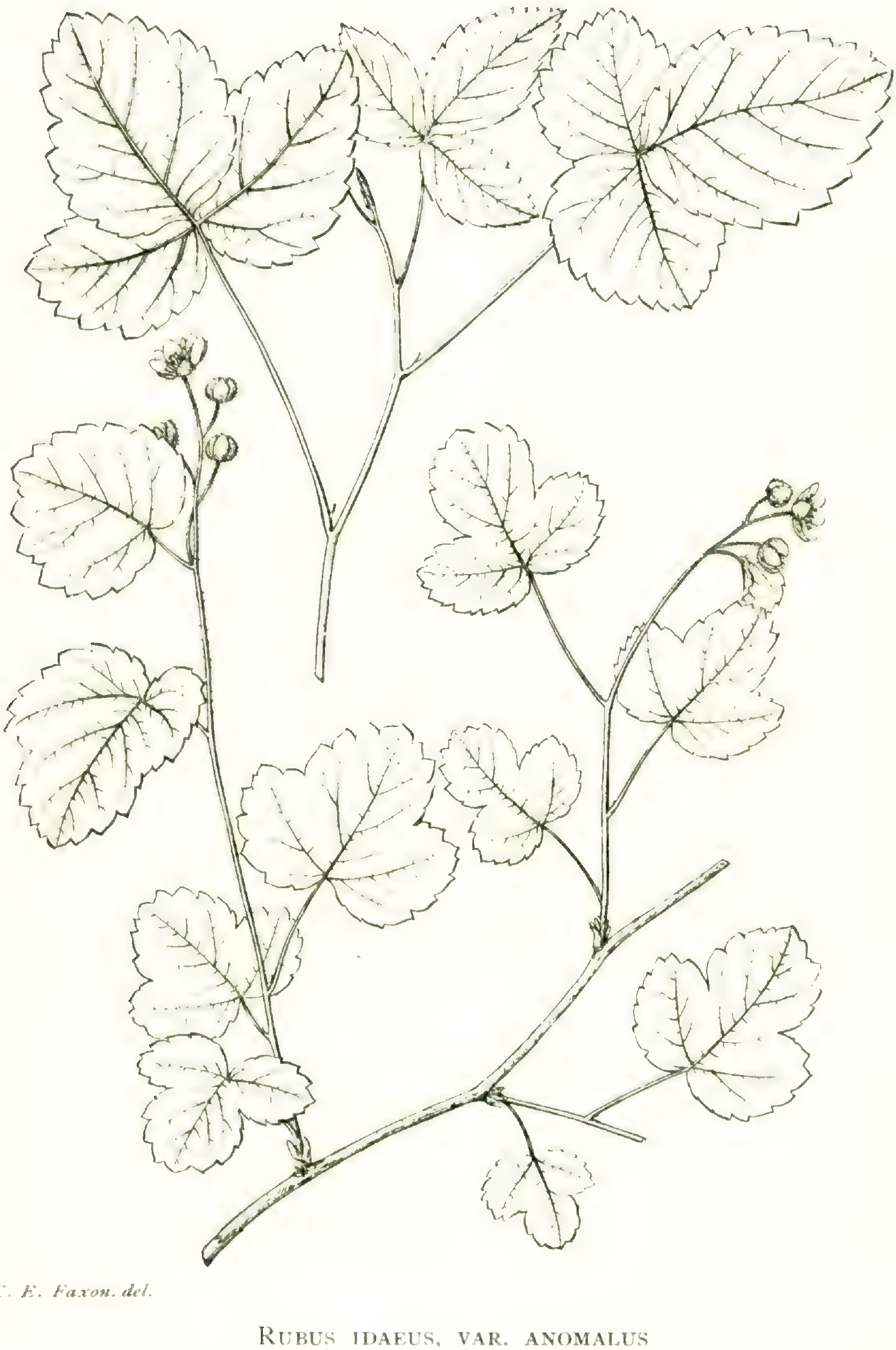

C. E. Faxon. del.

RUBUS IDAEUS, VAR. ANOMALUS

Rhodora

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RUBUS IDAEUS AND ITS VARIETY ANOMALUS IN AMERICA.

M. L. Fernald.

(Plate 20.)

Early in June a very remarkable Rubus was found by Mr. W. W. Eggleston in the crevices of limestone ledges at Cavendish, Vermont. The shrub, which is distinctly of the raspberry type, is characterized by its small roundish simple or rarely trifoliolate leaves, and at Cavendish it is associated on the ledges with another very local plant, *Arenaria macrophylla*, Hook. A careful study of the American raspberries shows Mr. Eggleston's plant to be referable to none of our described forms, but it is found, on the other hand, to be essentially identical with a very rare and much discussed Rubus of northern Europe, *R. idaeus*, L., var. *anomalus*, Arrhenius (*R. Leesii*, Babington).

This round-leaved raspberry is known in Europe from only a few limited stations in Scandinavia, Great Britain, Germany and Holland. Its discovery among the Green Mountains, then, is interesting as adding still another plant of northern Europe to our apparently indigenous flora. But its occurrence in America is noteworthy not merely from its geographic interest. The discovery of the plant at new stations in Europe has generally been the signal for a fresh discussion of its relationships, and these discussions have shown the variety *anomalus* to be phylogenetically one of the most significant members of the genus.

For several years the botanical journals of northern Europe contained extended articles and notes upon this Rubus, many of them offering suggestions as to the origin of the plant. In the English Botany, Boswell Syme suggests that "it may be a hybrid form, but

I [he] cannot think it probable that the species [*R. Leesii*] is a variety of *R. idaeus*."[1] The theory that the plant is a hybrid was further maintained by William Culverwell, a distinguished authority on hybridization as well as upon the genus Rubus. Mr. Culverwell published a figure of a plant, perhaps identical with the round-leaved *R. Leesii*, which he states was produced by crossing the strawberry and raspberry.[2] One of the main points in the argument for the hybrid origin of the plant was found in the general sterility of its drupes, a condition which, as we shall see, is otherwise satisfactorily explained by Dr. Focke of Bremen.

Among the numerous discussions of the round-leaved raspberry, one in particular is of interest to us. In 1873, Professor Areschoug published a paper entitled, "On Rubus Idaeus, L.; Its Affinities and Origin."[3] In brief, Professor Areschoug's argument was as follows: In Europe *Rubus idaeus* is a unique species, the other fruticose *Rubi* of Europe belonging to the blackberry type, and presenting such a variety of intergrading forms that their specific limitations are very obscure. *Rubus idaeus*, however, differs from all these species in having red or amber berries which separate readily from the receptacle, in having thin bark which scales off from the old canes, and in producing from the root buds which develop into canes. These and many minor points distinguish *Rubus idaeus* from the other European species. Yet this isolated European raspberry varies excessively, a tendency charactetistic of genera with many closely related species, but not ordinarily seen in plants isolated from other species of the genus or subgenus. Ordinarily, then, species which have a strong tendency to vary are more or less completely connected with each other — for instance, our American blackberries, or asters. "But *R. idaeus*, L., though greatly variable, produces no intermediate forms connecting it with the other European species, and this circumstance seems to me [Areschoug] to be of such importance that I consider it as belonging to another type."

From the study of material from different regions, Areschoug came to the conclusion that it is "very likely that *R. idaeus*, L., as well as the North American forms most closely related to it, have

[1] Syme, Eng. Bot. iii. 162.

[2] For detailed discussion see Gard. Chron. n. s. xx (1883) 12, 276, 342.

[3] Journ. Bot. xi (1873), 108–115 [translated and revised from Botaniska Notiser, 1872, 168–181].

their origin from species which primitively grew in Japan and adjacent countries." The relations of the European raspberry are undoubtedly with Asiatic and American species, and its closest ally is our common raspberry, *Rubus strigosus*, a species so closely related to *R. idaeus* that the two have sometimes been treated as one. *R. idaeus* is spread over Europe and western Asia and *R. strigosus*, common in North America, grows in Mandschuria and Japan and through Asia to the Altai; so that *R. idaeus* might have been derived from the American *R. strigosus*. Other evidence, however, shows that a large part of the flora of North America originated in eastern Asia,[1] and it is more probable that the European and the American plants had a common ancestor there, the plant with glandless calyx (*R. idaeus*) spreading westward into northern Europe; the other with glandular calyx (*R. strigosus*) crossing Behring Straits to the American continent.

Now the simple form is considered a more primitive stage in leaf-development than is the compound form, so that in *Rubus idaeus*, var. *anomalus*, we have a plant in which the leaves are much simpler in their development than are those of typical *R. idaeus* and the nearly identical *R. strigosus*. After critical study, then, Areschoug, Focke, Babington, and others have concluded that the extremely local round-leaved raspberry of northern Europe is an unusual form of *R. idaeus*, tending, as shown by its short, round leaves, to revert to a simpler ancestral type, and that the plant cannot well be considered a distinct species. This conclusion is well supported by the investigations of Dr. Focke, who says: "I found that the restraining process, by which the form of the foliage leaves was so curiously modified, extended also to the carpellary leaves, and that the axes of these was [were] shortened, so that they did not close and completely envelop the ovules. Of the two ovules in each carpel, one uniformly pined away at a very early stage; the other developed itself during the blooming time in the normal way, but only few carpels were produced. In most cases, however, they dried up whilst the flowering was in progress; and, though some appeared to be fertilized, yet seed entirely failed to ripen. The infertility of the plant I saw, was correlative to the character of its foliage; and we must look upon it as only a curious form of *R. idaeus*, which deviates from the type, so far as the

[1] See Asa Gray, Mem. Am. Acad., n. s. vi.; and extract, "The Flora of Japan," in Scientific Papers of Asa Gray, ii, 125.

form of the leaf is concerned, in the same manner that *Fragaria monophylla* deviates from typical *Fragaria vesca*."[1]

The discovery of this peculiar plant in the Green Mountains is a fact of great significance, and the questions immediately arise, is it truly identical with the European *Rubus idaeus*, var. *anomalus*, or is it a reversion of the similar (if not identical) American *Rubus strigosus?* In one particular alone do the American specimens differ from the European. Among the pubescence on the calyx and peduncles there are some stipitate glands, while the European plant ordinarily has no glands.

Upon this character — the presence or absence of glands — rests the separation of the American *Rubus strigosus* and the European *R. ideaus.* Yet the production of glands, as well as other characters, is very inconstant in the American species. Ordinarily characterized by the glandular calyx, plants are sometimes found with all possible gradations from the glandular to the glandless state. Before me are two numbered specimens of the American plant with absolutely no glands upon the calices — a sheet from Assiniboia, collected in the Cypress Hills by John Macoun (no. 4,550), and another from the Black Hills of South Dakota, collected in Elk Cañon by Rydberg (no. 657). These specimens are, very naturally, called *Rubus strigosus*, Michx., but, were they from European collectors, they would pass without question as *R. ideaus*, L. Other American specimens show strong tendencies toward the European *R. idaeus.* For example, Piper's no. 2879, from Moscow Mountains, Idaho, though with numerous prickles on the calyx, is practically glandless. Often, too, shrubs growing in shade show a strong tendency to lose not only the glands of the calyx but the white pubescence ordinarily characteristic of the leaves. Such tendencies are well illustrated by Piper's no. 2,268, from woods at Spokane, Washington, and by Sandberg, MacDougal, and Heller's no. 259, from rich bottoms in Nez Perces County, Idaho. Similar variations are more or less familiar to all who have watched the American plant in the field. Yet there is, without doubt, a very marked tendency toward the production of glands in the American plant, while the European form is commonly glandless. Maximowicz, following the views of some earlier authors, has treated the American and Asiatic plant as a variety of the European (*R. idaeus*, var. *stri-*

[1] O. W. Focke, Journ. Bot., x. 27 [translated from the Oesterreichische Botanische Zeitschrift, 1870, 98].

gosus, Maxim.[1]), and there is little doubt that the relationship of the plants is thus more truly presented than by the forced separation of them as specific types. The extreme tendency, as seen in the American plant, to variation not only in leaf but in the degree of gland development, is sufficient to suggest that Maximowicz may be too liberal in his treatment of the glandular plant, for, if in the open one can find the glandular form, and near by, in shade, numerous variations to the glandless state, the recognition of the American plant, even as a geographic variety, seems scarcely warranted.

Nevertheless, whether we regard the two plants as representing mere phases of a polymorphous species, *R. idaeus*, or as somewhat characteristic geographic varieties — the glandular extreme encouraged by the dry atmosphere of the American continent, the glandless one by the moister atmosphere of northern Europe — there is little doubt that they are practically one species. And although the round-leaved plant of the Green Mountains bears upon its calyx more glands than are usual in the European plant, there seems little reason to distinguish it as another variety. That the variable American plant with glandular calyx should occasionally produce a sport parallel with the glandless European var. *anomalus* is possible, and such extreme variations may be looked for with some confidence.

But, in the case of the Cavendish station, it seems not improbable that the plant had the same geographic origin as the colonies in northern Europe, for, at the same station, at least one other plant is known which is far removed from the broad range of its species. There, as already mentioned, is found *Arenaria macrophylla*, a species characteristic of the mountains of our Pacific slope, though occurring also at isolated stations on the Great Lakes and in Labrador. The small Rubus at Cavendish, then, is associated with a plant, which, with little doubt, was established there during the northward march of the vegetation at the close of the Glacial Period; and it is reasonable to suppose that the Rubus, formerly growing in circumpolar regions, was forced south by the southward extension of the ice, most of the plants[2] following the meridians which pass through northwestern Europe, but a few following down this side of the Atlantic; and now a remnant of

[1] Bull. Acad. Sci. St. Petersburg, xvii. (1871), 161.

[2] Although this plant ordinarily produces no fertile drupes, according to Babington (Jour. Bot. xvi. 85) occasional good seed are formed — probably enough to have spread the plant to its few scattered stations.

the ancient American colony persists in this sheltered situation in Vermont, as does *Arenaria macrophylla*, and as, in better known stations, do *Diapensia lapponica*, *Cassiope hypnoides*, and scores of other plants of more northern origin.[1]

If this be the true explanation of the source of the Cavendish colony of *Rubus idaeus*, var. *anomalus*, the plant must have occurred among the Green Mountains for thousands of years; but that it is extremely local and scarce is obvious from the fact that it has remained unobserved upon this continent until the present year. This extreme scarcity of the plant, in a region where the climatic conditions seem favorable, is probably due to the usual sterility of the drupes as emphasized by the European authors who have studied the plant, and as likewise observed by Mr. Eggleston at the Vermont station.

If, on the other hand, the Cavendish plant is considered a reversion of the glandular *Rubus strigosus*, we are adding nothing to the argument that the American and European species are distinct, for, if the two plants produce occasional sports so similar as to be undistinguishable, we have fair evidence of their common ancestry if not identity. In view of the extreme inconstancy of the glandular character of the two plants — the chief character relied upon to separate them — it seems best to consider our American *R. strigosus* specifically identical with the European *R. idaeus*, and to treat the small round-leaved variety from the Green Mountains as *R. idaeus*, var. *anomalus*.

Gray Herbarium.

Explanation of Plate 20. *Rubus idaeus*, L., var. *anomalus*, Arrhenius, drawn from a Vermont specimen by C. E. Faxon.

Commelina Virginica established in New England. — *Commelina Virginica*, recorded in the Manual as occurring from New York southward, has now for some years maintained itself perfectly in several parts of Providence, coming up each year and blooming profusely. It escapes from hot houses and winter gardens. — W. W. Bailey, Brown University.

[In some places about Boston and Cambridge, this *Commelina* has persisted for years in damp yards and in waste ground. — Ed.]

[1] See Rhodora, ii, 138–139.

FURTHER NOTES ON THE FLORA OF WORCESTER COUNTY, MASSACHUSETTS.

C. H. Knowlton.

During the past year I have collected extensively about Webster, one of the southern towns of Worcester County, Massachusetts. The results have been very satisfactory. Thompson, Conn., joins Webster, and also affords an interesting botanical field. I have been greatly assisted in observation by Mr. L. J. Spalding, of Webster, and have frequently compared notes with Mr. R. M. Harper, of Southbridge. Mr. Joseph Jackson's County Flora, has also been of great assistance. The asterisk indicates plants not included in that work.

* *Ranunculus repens*, L. Thoroughly established in and around a brook at East Webster. This crowfoot is rare in interior Massachusetts, and may be introduced.

Xanthoxylum Americanum, Mill. This grows abundantly in Thompson, Conn., near the state line, and it is to be expected in Massachusetts. In Worcester County it has been reported only from Millbury.

* *Rubus setosus*, Bigelow. Low thicket, East Webster.

* *Lythrum Salicaria*, L. Muddy shores of the Quinebaug and Maanexit rivers, Dudley and Oxford, in great abundance. Not considered common in central Massachusetts.

Circaea alpina, L. Cold woods. Purgatory Chasm, Sutton, also Athol. Very local in the county.

Cornus circinata, L'Her. Rich woods, Douglas and Sturbridge.

Linnaea borealis, L. Common, Royalston and Athol. Previously reported from Gardner and Templeton, and to be expected throughout the northern towns of the county.

* *Aster vimineus*, L., var. *foliolosus*, Gray. Dry fields, Webster. The type is common.

Rhododendron viscosum, Torr., var. *glaucum*, Gray. Rich woods near a brook, Dudley, not far from the Charlton line, but a considerable distance from the station where it was reported by R. M. Harper. (Rhodora, ii, 122.)

Limnanthemum lacunosum, Griseb. Shallow water, Whitin Pond, Northbridge. Though not much known in Worcester County, it is to be expected in any pond where the level has not been too much altered.

Gratiola Virginiana, L. Wet place in a clearing, Sutton. Previously reported from Lake Quinsigamond.

Polygonum Muhlenbergii, Watson. Shallow water of Maanexit River, North Webster. Very local in the county.

Polygonella articulata, Meisn. Roadside, Dudley. Apparently frequent in the towns of the southern border.

Betula papyrifera, Marshall. Occasional in rich woods, Webster, Dudley. Not common in the southern towns of the county.

Abies balsamea, Miller. Although supposed to be restricted to the northern towns of the county, small trees (not fruiting) occur in Webster and Dudley.

Taxus Canadensis, Willd. Abundant in deep woods, Royalston. Previously reported from Worcester.

* *Scirpus subterminalis*, Torr., var. *terrestris*, Paine. Abundant in a small pond in Dudley (altitude 540 feet), September 9, 1899. The pond is a part of a reservoir system, and, owing to a drought, its water had been largely drawn off. The conditions were thus favorable for the development of this interesting form, which is not likely to persist. Previously reported only from Herkimer County, N. Y.

* *Rhynchospora alba*, Vahl. Sandy shore of brook, Webster. From this and Mr. Harper's observations, the species seems to be rather frequent in southern Worcester County.

* *Cladium mariscoides*, Torr. Sandy swamps, Webster. Reported from Brookfield and Sturbridge.

* *Panicum filiforme*, L. Sandy field, Oxford. Previously reported only from Brookfield.

* *Panicum proliferum*, Lam. Abundant around a small pond, Dudley. Reported from Brookfield.

* *Panicum virgatum*, L. Sandy swamp, Webster. Reported from Brookfield.

* *Aristida gracilis*, Ell. Roadside, with *A. dichotoma*, Webster. Reported from Sturbridge.

* *Woodwardia Virginica*, Smith. Swamp near R. R. track, Douglas. Reported from Webster.

* *Botrychium matricariaefolium*, Braun. Dry thicket near Purgatory Chasm, Sutton. Very local.

Chelmsford, Mass.

SOME NEW ACQUAINTANCES.

William P. Rich.

The plant-hunter whose range of observation is restricted by the force of circumstances to a distance of not more than a day's journey to and from his home, and more often to a half-day's outing, gradually finds that his well-gleaned fields no longer offer him the novelties which once rendered buoyant his steps and cheered the long homeward walk with pleasing anticipation of what some new discovery would prove to be. After several excursions in which nothing new is added to his lists, however interesting and profitable they may be in other ways, his waning interest is one day suddenly revived, and his enthusiasm rekindled, as he comes across not only one new plant, which ordinarily would be satisfactory enough, but upon a numerous company of weeds, many of which he has never before seen. They prove to be a colony of recently introduced plants, and although these newcomers are regarded by some as of little account, and stigmatized as interlopers and vagrants, they are welcomed by the local botanist, affording him glimpses of the vegetation of distant regions which he can never expect to visit.

These enterprising plants, not contented with the means furnished by nature for their dissemination, have in these later days taken to travelling by rail. They suddenly appear in vacant lots around freight yards, along railway banks, and on city dumps, with perhaps the best intentions of settling down for a permanent residence and the praiseworthy purpose of covering unsightly places with their verdure. Their reception, however, is not very cordial. The hand of man is against them, and they do not tarry long with us. The space they occupy is wanted for other purposes, and, like the Wandering Jew, they are soon forced to move on; their coming and their going noted, however, with pleasure by the few observers interested in such things.

A company of these tramps of the vegetable kingdom has during the last three years taken up a temporary abode on a railway bank at Dedham, Mass. Here they have flourished luxuriantly during the summer until the annual mowing of the weeds in August by the railway men, to which has been added the present year the burning over of the locality, so that it is probable that most of these chance visitors will be found here no more. In view of the certain extirpation of this interesting botanical settlement, many of the species having already

succumbed to the fierce attacks made upon them, a record of some of the plants found here may be of value.

Salsola Kali, L., var. *Tragus*, Moq. (the Russian thistle). This was first observed here by the writer, August 22, 1897, when two bushy plants about a foot high were seen. It has since shown a tendency to increase, twenty plants having been counted the present season, August 4, a few of them three hundred feet distant from the original location. The plants first seen were quite different in general appearance from *Salsola Kali*, the seashore species. They were bushy-upright, their slenderer, greener leaves and stems contrasting strongly with the decumbent, coarse, succulent plant of the seashore. Later plants, however, seem to have changed their habit somewhat, by becoming more prickly and prostrate, and now as it grows along the gravelly railway track does not appear so very different from the species of which it is probably only a variety. In this connection it may be stated that in the *Journal de Botanique*, 1887, p. 281, M. Constantin records the fact that when *Salsola Kali* grows along river banks away from the sea it loses the fleshy character of its leaves and passes into the var. *Tragus*. This locality, with the one reported in Rhodora, Vol. I, p. 47, by Mr. J. F. Collins, at Providence, R. I., appear to be the first records of the arrival in New England of this western pest.

Bidens bipinnata, L. (Spanish Needles), was found growing abundantly on the occasion of a visit made October 2, 1898. Its tufts of prickly-barbed awned akenes made it a conspicuous object amidst the other plants. It was apparently of short life here, none having been seen by the writer since.

Ambrosia trifida, L. (Great Ragweed). Numerous plants of this species, some of them attaining a height of seven feet, have been seen on every visit during the last three years. It presents a striking appearance, with its large three-lobed leaves, and, although coarse and rough, it is an interesting plant when seen for the first time. Although pronounced common in the Manuals, it is a rare plant in eastern Massachusetts, occurring only on waste ground, where it is doubtless introduced from the West.

Xanthium strumarium, L. (Cocklebur). A few plants of this not very common species were seen in mature fruit, October 2, 1898. It is easily distinguishable from the much more common and similar plant, *Xanthium Canadense*, Mill., by its smaller bur, which is at

maturity about one half the size of the latter, and by its nearly glabrous surface, the bur of *X. Canadense* being densely hispid. *Xanthium spinosum*, L. (Spiny Clotbur) was also noticed here.

Chenopodium ambrosioides, L. (Mexican Tea). Never before has the writer seen hereabouts what could unhesitatingly be pronounced this species. Its very leafy spikes, nearly entire upper leaves and repand lower leaves, presenting a different looking plant from the one with naked elongated spikes and coarsely toothed leaves known as the var. *Anthelminticum*, Gray, which is so common on waste grounds around Boston. There were, however, some plants growing with it of an intermediate character, showing that the two plants are not specifically distinct.

Sisymbrium altissimum, L., was very abundant the present summer. When mature it loses all its leaves, leaving only a mass of long, stiff, slender pods, which stand out in all directions from the stem and branches.

Berteroa incana, DC. (Hoary Alyssum). This grows abundantly on a grassy bank and along the roadside in the immediate vicinity of the railway.

Conringia perfoliata, Link., which escaped the notice of the writer, was collected here June 27, 1897, by Mr. E. F. Williams.

Verbena bracteosa, Mich. Two specimens of this western plant were collected August 4.

Hibiscus Trionum, L. (Bladder-Ketmia), a branching annual with an inflated calyx, was also among the strange plants found.

In addition to the above list, nearly all of which were collected by the writer for the first time, there were noted the following plants that are more commonly found in this part of the State:

Cenchrus tribuloides, L., *Echinospermum Lappula*, Lehm., *Lithospermum arvense*, L., *Stachys palustris*, L., *Ricinus communis*, L., *Galeopsis Tetrahit*, L., *Solanum rostratum*, Dunal., *Amarantus blitoides*, Watson, *Artemisia vulgaris*, L., *Lactuca Scariola*, L., *Galinsoga parviflora*, Cav., var *hispida*, DC., and *Lechea maritima*, Leggett.

NOTES ON TWO RARE ALGÆ OF VINEYARD SOUND.

R. E. Schuh.

The following notes are offered in a somewhat extended form, in the hope that by calling attention to these species their known range may be considerably enlarged.

Giraudia sphacelarioides, Derb. and Sol., has been so confidently sought on our coasts that Dr. Farlow, twenty years ago, in the Marine Algæ of New England (p. 75), gave a brief description of it. Yet no one seems to have discovered it until I found a well-grown, but sterile, specimen at Vineyard Haven, in August, 1892. Nothing more was seen of it until fruited forms were collected at Cottage City in January, 1895. It then occurred sparingly on *Zostera*, intermingled with *Punctaria*, *Ectocarpus*, and various small species. It is easily overlooked, as it is but 5 to 10 mm. high, and usually only a few filaments are found together. It may readily be recognized by having a thallus which is polysiphonous above and monosiphonous below. A figure, copied from Hauck, is to be found in Bennett and Murray's Cryptogamic Botany, p. 238. As this is a common Mediterranean species, it should be sought late in autumn in Long Island Sound and in Rhode Island waters.

Pogotrichum filiforme, Reinke. This small alga was a most surprising find in our waters. It was before only known to occur rarely at Helgoland, where it was collected by Reinbold. It is described and figured by Reinke in his Atlas Deutscher Meeres-Algen, p. 62, pl. 41, figs. 13–25. In January, 1895, three fertile and unmistakable specimens, bearing unilocular sporangia, were found at Cottage City. It was then growing on *Zostera*, in company with *Desmotrichum*, *Giraudia*, and various small species. The specimens distributed in Hauck & Richter, Phycotheca Universalis, No. 470, are about 40 mm. high; our forms are dwarfed to one tenth that size, but otherwise correspond closely with the type. The plant consists of several fine filaments (arising from a thin substratum), which are composed usually of a single series of quadrate cells, .015–.030 mm. wide. Occasionally these may be divided, so that for a short space two or more series may be found side by side. The European specimens are olive-brown, but ours are almost hyaline, except for a space along the center of the filaments, where the darker spores are borne singly in superficial cells which surround the underlying thallus so closely that

it is entirely hidden. The plurilocular sporangia may be recognized by their resemblance to those of *Ectocarpus*. The identification of our specimens is due to the courtesy of Professor Farlow.

Since these notes were in type another very small specimen of *Pogotrichum filiforme* has been discovered, which shows that this interesting form still persists in New England. It occurred now upon *Sertularia pumila*, Linnè, among *Sphacelaria*, upon a bit of *Ascophyllum* which also harbored *Clava leptostyla*, Ag., a hydroid which is rather common on the *Fucaceæ* at low water mark on exposed shores. I am informed by Mr. G. W. Gray, Curator of the Marine Biological Laboratory, that the specimen in question was collected at Woods Hole about the end of last October. Since Vineyard Sound is a waterway used by many foreign vessels, it is not improbable that this plant is merely a waif from alien waters. Possibly future collections may cast light upon this interesting question.

BRISTOL, R. I.

PLANTS FROM THE DUCK ISLANDS, MAINE.

EDWARD L. RAND.

THE Duck Islands, two in number, and small in area, lie seaward about ten miles off the coast from Southwest Harbor, Mt. Desert Island, Maine. The smaller island, Little Duck, is high, poorly wooded, partly cleared, and uninhabited. From a botanical point of view it is little explored. The larger island, Great Duck, is divided by a marshy depression from north to south, and is mostly cleared, but has some old woods still remaining. It is now the site of a lighthouse, and therefore inhabited by others besides the fishermen who often make temporary summer homes on both islands. Before the lighthouse was built, however, it had been long inhabited, until fire destroyed the farmhouse and forced the settler to make a home elsewhere. Sheep now graze over a large part of this island, and, as usual, make collecting most unsatisfactory to a botanist.

Some years ago, the late John H. Redfield, while engaged in work on the flora of Mt. Desert, considered the plants of these small outlying islands of sufficient interest to warrant the compilation of a list, as he from time to time observed them. Two lists were published by him in the Bulletin of the Torrey Botanical Club, xii : 103

(1885), and xx: 409 (1893). These lists are of course far from complete, and represent only the results of a few short visits to the islands.

All visits are necessarily short, for access to the islands is difficult for many reasons, and landing on the rocky shores is uncertain at any time. It is only therefore by a compilation of the results of a number of these hurried botanical observations that sufficient information can be obtained concerning the plants found there for comparison with those of the inner islands, and of the mainland. The following list represents the plants, not contained in Mr. Redfield's lists, found by me during a short visit made last summer, with the addition of a few plants found at other earlier visits.

It may be said that thus far *Cerastium arvense* and *Montia fontana* are the most interesting plants discovered on these islands. The former plant, although common on Great Duck, is unknown elsewhere in the region, and doubtless was introduced by some cause. The latter plant is unknown elsewhere in the eastern United States except on Great Cranberry Isle, some miles further inshore.

It should be here noted in regard to Mr. Redfield's lists that *Polygonum incarnatum* there recorded, is an error; and that for *Prenanthes alba*, we must probably read, *Prenanthes serpentaria*, Pursh. These corrections were made by Mr. Redfield himself at the time of preparing the Flora of Mt. Desert for publication.

Cardamine parviflora, L.
Cakile americana, Nutt.
Viola blanda, Willd.
V. lanceolata, L.
Stellaria borealis, Bigel.
Buda borealis, S. Wats.
Geranium Robertianum, L.
Lathyrus maritimus, Bigel.
Rubus triflorus, Richards.
Fragaria virginiana, Mill.
Potentilla littoralis, Rydberg.
Lonicera caerulea, L.
Aster Novi-Belgii, L.
A. nemoralis, Ait.
Taraxacum erythrospermum, Andrz.
Vaccinium Oxycoccus, L.
Galeopsis Tetrahit, L.
Plantago major, L.
Atriplex patulum, L., var. *hastatum*, Gray.
Polygonum Hydropiper, L.
Urtica gracilis, Ait.
Microstylis ophioglossoides, Nutt.
Pogonia ophioglossoides, Ker.
Zostera marina, L.
Eleocharis palustris, R. Br., var. *glaucescens*, Gray.
E. tenuis, Schultes.
E. acicularis, R. Br.
Eriophorum vaginatum, L.
E. virginicum, L.

Carex rigida, Gooden.,
  var. *Goodenovii*, Bailey.
C. maritima, O. F. Mueller.
C. Magellanica, Lam.
C. flava, L. var. *viridula*, Bailey.
C. sterilis, Willd. (forms)
C. canescens, L.
C. trisperma, Dewey.
C. straminea, Willd.,
  var. *aperta*, Boott.
Agrostis alba, L.,
  var. *vulgaris*, Thurb.
A. alba, L.,
  var. *stolonifera*, Vasey.
Calamagrostis canadensis, Beauv.
Danthonia spicata, Beauv.
Poa compressa, L.
P. pratensis, L.
Osmunda cinnamomea, L.

THE MARINE FLORA OF GREAT DUCK ISLAND, ME.

F. S. Collins.

The location and character of the Duck Islands are indicated in another article in this number of Rhodora, by Mr. Rand, with whom I visited Great Duck Island last July. While he was investigating the land flora, I gave my attention to the marine flora, and that it is interesting may be inferred from the fact that I did not once step above high-water mark, though I was among the first to land and the last to re-embark. The shore near the landing point shows a nearly horizontal stratification, with a slight upward slope seaward. There is thus formed a series of terraces, each with a shallow pool along its inner half. The bottom and sides of these pools are richly coated with algae, and the general development of the flora here is more luxuriant than on Mount Desert Island itself, even at exposed points. Why a small outlying island should have a more luxuriant flora than an exposed part of a larger island or of the mainland, it is hard to say; but on the New England coast, at least, this seems to be the case.

Perhaps the most striking feature here was *Ralfsia deusta* J. Ag., carpeting the bottoms of pools, sometimes in patches more than a square meter in extent. This is a characteristic northern species, its extreme southern limit on this coast being Nahant, Mass., and I had never seen it so luxuriant as here. Those who know it only from dried, shrunken, uniformly dark brown herbarium specimens, have no idea of its beauty when growing. It consists of horizontal, overlapping, fan-shaped fronds, radiately striate and concentrically zoned in

shades of brown and yellow, lightest at the margin, sometimes reminding one of a small and delicate Polyporus. Under this surface of vigorous fronds is a thick mass of old, overgrown fronds, the lowest practically a structureless mass. Probably many years' growth is needed to produce one of these thick carpets. Though all the other species of this genus fruit abundantly, the fructification of this species is yet to be discovered, and the Duck Island specimens, for all their luxuriance, show nothing but vegetative growth.

Turning from a rare and local species to a widely distributed and very common one, *Polysiphonia urceolata* (Lightf.) Grev. presents a curious form here. I can find nothing in the many descriptions of this plant in regard to a creeping base; but here it formed dense mats of rooting filaments, from the centre of which arose the well-known vertical tufts. Where only the prostrate filaments occurred, no one would suspect, without careful examination, that the brownish circular disk, a few centimeters in diameter, belonged to this common species.

Laminaria platymeris De la Pyl. also shows different characters here from what it has in some other places. As noted by Setchell,[1] in Massachusetts bay it is epiphytic on the larger Laminarias; but here it grows on the rock sides and bottoms of the larger pools.

In less than three hours' time, within a stone's throw of the point of landing, I noted sixty-one species and two varieties of algae. Notice of microscopic forms was out of the question; but if we make a fair allowance for them, for plants preferring the different character of shore which occurs in other parts of the island, and plants to be found at other times of the year, the number given would probably be doubled. It is therefore hardly worth while to give a list as incomplete as our present must be. The Laminariaceæ were strongly represented, both as to species and individuals, and there were five species of Fucus. The general brown aspect that these large plants gave to the region was relieved by the green of Cladophoras of the Acrosiphonia group, and the pink and white of Corallina and Lithothamnion. Most of the red algae were dull colored, but there were some superb broad fronds of *Rhodymenia palmata* (L.) Grev., half a meter in length, each frond full of tetraspores throughout; while small, but bright, fronds of *Polysiphonia urceolata* (Lightf.) Grev., and of *Gloiosiphonia capillaris* (Huds.) Carm., lighted up the shallow pools.

[1] Rhodora, Vol. II, p. 143.

The thoroughly northern character of the flora made a hasty visit tantalizing; one felt that a longer stay might be rewarded by some of the curious forms that Rosenvinge has found at Greenland, many of them growing on host plants that abound here.

POGONIA PENDULA IN MAINE.

Le Roy Harris Harvey.

While on an extended collecting trip along the western border of Maine, in the fall of 1899, the writer in company with a botanical friend, climbed Frost Mountain for the purpose of obtaining specimens of the maiden-hair spleenwort, *Asplenium Trichomanes*, L.; the ebony spleenwort, *Asplenium ebeneum*, Ait., and the rusty Woodsia, *Woodsia Ilvensis*, R. Br.

Frost Mountain, having an altitude of about 3600 feet, is situated in the town of Brownfield, forty miles northwest of Portland, ten miles south of Fryeburg, and five miles from the New Hampshire line. The ascent was made on the southwestern slope. Nearly half way up we passed through a ravine-like depression ,covered with hard growth, mostly beech. As we mounted the further slope of this ravine, we simultaneously uttered exclamations of surprise, and hastened forward to examine more closely our find, which we readily recognized as *Pogonia pendula*. Growing in an isolated clump, were four specimens — three well developed and one aborted. The plants were firmly rooted in a bed of leaf mould over granite formation. Two of the plants were carefully dug up for our herbaria, and the others left, as we hoped thus permanently to maintain the locality. We searched very carefully over the immediate slope, but to no avail.

This is the first time the nodding pogonia, *Pogonia pendula*, Lindl. has been reported east and north of Lake Winnipiseogee, N. H., and is the fourth authentic locality in the New England states.

I append the following data, which have been kindly put at my disposal by Mr. Emile F. Williams of Boston, who is compiling a check-list of our New England orchids.

Mr. Williams has examined, to date, the following herbaria — Gray; Brown University; W. P. Rich, J. R. Churchill, C. E. Faxon, Boston; G. G. Kennedy, Milton; Walter Deane and M. L. Fernald, Cambridge; C. H. Bissell, Southington, Conn.; J. F. Collins and W. W.

Bailey, Providence — and has found in them only a single specimen of *Pogonia pendula*, this being in the Gray herbarium, collected by Prof. D. C. Eaton at New Haven, Conn. No data further than locality were given. Mr. F. W. Batchelder exhibited, at a meeting of the New England Botanical Club in 1899, a specimen collected from a large patch on the shores of Lake Winnipiseogee. In Mr. Williams's herbarium are two specimens collected by Mrs. Walker at Wilton, N. H., on the fifteenth day of August, 1899. The specimen in the writer's herbarium bears the date, August 15, 1899, being the exact date of the collecting of the specimens in Mr. Williams's herbarium.

Baldwin gives *Pogonia pendula* as being found in three towns in New Hampshire, one in Vermont, four in Massachusetts, one in Rhode Island, and five in Connecticut. It is very doubtful, however, whether Mr. Baldwin saw specimens from the above localities, as many of his records were based upon unverified reports.

Careful search along our New Hampshire border ought to reveal several more localities for this beautiful and somewhat rare orchid.

University of Maine, Orono.

To Fern Collectors. — Having now taken up my manuscript for a Text-Book and Synopsis of the Ferns of North America, planned in 1880, with the intention of revising and completing it for publication, and wishing to fill out more completely the Distribution Tables published in the Transactions of the Philosophical Society of Philadelphia for February, 1883, I should be glad to receive from any one accurate lists of ferns known positively to grow within the limits of their states or vicinities.

Specimens for verification, and vouchers, are also desired and will be returned to sender whenever requested. — George E. Davenport, 67 Fellsway West, Medford, Mass.

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THE OLD-TIME FLORA OF PROVIDENCE.

Wm. Whitman Bailey.

It is always most interesting, when possible, to learn the former plant life of a great city. Especially is this so when one has himself collected over the same ground at a later date. His surprise and delight are uncontrollable, to ascertain the presence of some essentially wild species on what is now a crowded thoroughfare, or where at present is located a public building.

Thus, Dr. John Torrey, the noted co-worker with Dr. Asa Gray, kept a record of the plants growing in New York City, and the vicinity, some eighty years ago. It is funny enough to read to-day — when the original city extends into Westchester, and when the Greater New York has embraced Brooklyn and Staten Island — of the wildernesses teeming with wild-flowers in the suburban regions of Canal Street and Union Square.

Fortunately, without the same intention, indeed with none but to make a passing note for his own benefit — with no attempt at thoroughness even, — my father, when a young cadet at West Point, kept on his visits home to Providence a record of what he there found. He entered the Military Academy in 1828, graduating in 1832, and the record contains dates to 1837 — at which time he was professor in his alma mater.

The book he employed as a manual in those days was the well-known *Florula Bostoniensis* of Bigelow. It is now in my possession, and is indeed a precious heirloom. It is, of course, arranged on the Linnaean system, in which no attention is given to natural affinity. There were no illustrations, but these were added by my father from time to time, in neat, shaded pencil-drawings, the outline often being

in ink. Many of these sketches are really beautiful. Even the printed pages are employed as a medium for illustration.

In viewing the "finds" of those long-ago days, one must consider the very different topography that then existed; also that our waters were formerly quite undefiled. Remember, for instance, that the cove was a natural estuary of tolerably pure water, in which one could bathe, and around which grew many littoral plants. To the north there were sloping banks, leading up to the extensive pine-forest on Smith's Hill. Indeed, I myself recall such conditions. Near the Vitriol Works, as late as 1868, I gathered such plants as *Leucothoe racemosa*, Gray, *Rhododendron viscosum*, Torr., and *Cephalanthus occidentalis*, L.

Again, even in my day, Long Pond, now filled in, was a charming collecting ground, and it was only the other day, as it were, that a new causeway throttled Greater Benedict Pond. Many fine things used to grow there, among them *Plantago Virginica*, L.

When I first knew Leonard's Pond, in the tenth ward, it was not even in the city, and only a very few houses were in sight. Now a dense population is gathered near it. Here I used to go for *Epigaea repens*, L., and *Cypripedium acaule*, Ait. In Bradley's Swamp nearby, almost up to the seventies, grew a patch of *Rhododendron Rhodora*, Don.

About Wanskuck, now a populous factory-village suburb of the city, was a wild wood, and a most delightful and romantic walk extended along the west bank of Randall's Pond, the earliest haunt of the Mayflower.

Cat Swamp, the Mecca of Botanists, was, even in my day, inviolate. Fortunately its flora was collected by many acute observers, and colored drawings made by a Mr. Peckham. These I learn are still accessible.

Slate Rock, sacred to Roger Williams, was, when I was a boy at the University Grammar School, still in part surrounded by water. We youths bathed from it where the water would now insure prompt asphyxiation. A clear, lively brook babbled through and gave its name to Brook Street. I remember it was open between Power and Williams St., by the residence of Chief Justice Ames. Charming groves extended to the river-side below the Rhode Island Hospital — where were the park-like grounds of G. W. Rhodes. Various gas-houses and power-works have usurped the place of these rural attractions. North of Angell Street, on College Hill, houses were few and

far between. Even on the University grounds, what is now known as the "Back Campus," contained a prolific swamp, well within the time limits of my own teaching.

The banks of the Seekonk have so changed as to be wholly unrecognizable. Beautiful forests, groves of laurel, meandering trout brooks, banks gay with lupines and azalea, sands gushing with violets, swamps, copses, and fens, presented a delightful and rural variety. Nothing is left of all this but a sweet and imperishable memory.

Now let us revert to the still older days of 1828 and see what is recorded. I might note in passing, that there was at that time in Providence a group of able and enthusiastic young botanists, among whom we find the names of S. T. Olney, George Hunt, Jesse Metcalf, A. L. Calder, George Thurber, and J. W. Bailey. These men, though afterwards in part scattered, always kept in communication with each other, and all had a deep pride in Rhode Island.

I again direct attention to the Linnaean arrangement of Bigelow to account for the random way in which this record will appear. I copy the notes as they come.

First, we find recorded the purple bladderwort, *Utricularia purpurea*, Walt., at Long Pond, a charming plant to find anywhere. The locality has totally disappeared, — as has the pond itself, though up to my time it was still excellent collecting ground. Its site is now given over to *Lactuca Scariola*, L., and threats of the Russian thistle! It is possible that this bladderwort may still be found at Little Benedict Pond near by — a most delightful hole, full of *Brasenia peltata*, Pursh, *Nymphaea odorata*, Ait., *Nuphar advena*, Ait., and various *Sagittariae*, *Spargania* and *Myriophylla*. Near by grew, and perhaps still grows, *Coreopsis rosea*, Nutt., which my father records as "abundant" in 1828, at Long Pond.[1] My only certain locality for it now is near Pawtucket, where it is accompanied by *Eupatorium hyssopifolium*, L., *Utricularia purpurea*, Walt., *Aster spectabilis*, Ait., and other nice things.

Circaea alpina, L., is recorded from Providence, without special locality, and *Iris prismatica*, Pursh, from Seekonk, in what is now East Providence. The latter is abundant there still. In the old canal, long since abandoned even before my day, is noted *Rhyncospora alba*, Vahl. and at Leonard's Pond, *R. glomerata*, Vahl. *Anthoxanthum odoratum*, L., is dated "Providence, April 12, 1828." It is one of our

[1] Since this was written a careful exploration fails to find it.

commonest grasses giving the delicious odor to new-mown hay. We also have *Hierochloa borealis*, Roem. & Sch., but these old notes do not record it.

It is interesting to learn that *Symplocarpus foetidus*, Salisb., turned up March 8, 1828 — a good average record. We can fancy how glad those young collectors, all now passed away, were to welcome its parti-colored hoods!

At the other end of the season we find *Hamamelis Virginica*, L., marked as occurring in Tifft's woods, a location which I fail to identify. Buck-bean grew then where even now it flourishes — this year perhaps for the last time — near the Friends' School. This is by far the best locality for *Menyanthes* I have ever known. I think it is within our city limits, also in the suburb of Cranston. Cat Swamp is being drained and filled in so that *Menyanthes trifoliata*, L., must disappear, with the Typhas. *Acorus Calamus*, L., and many splendid *Carices*, among them the one called *Olneyi*, Boott., which, however, does not seem to stand. I have a letter from Hart Wright of years ago questioning its stability, and I think L. H. Bailey and others have merged it with an old species. Happy those whose monuments can survive a generation!

The bind-weed, *Convolvulus sepium*, L., is described as occurring on the banks of the "Providence Canal" near Horton's Grove, July, 1830. This old abandoned canal, extending from Providence to Worcester, early had its commercial usefulness destroyed by the railroad between these two cities. Thereafter it became largely choked with aquatics and lawsuits to the mutual joy of the botanist and lawyer. So, some few years since, when my assistants, Messrs. J. Franklin Collins and Haven Metcalf desired some *Elodea Canadensis*, Michx., for physiological work, I directed them to find it in the canal — which they did. I had not seen it myself!

The Jersey tea, *Ceanothus Americanus*, L., is simply noted as from Providence — and still grows in the municipality. One marvels if in 1828 the rose-bugs came too! Now-a-days the plant is always thronged with them.

Under *Viola pedata*, L., the most abundant and most beautiful of our Rhode Island violets, adopted by the school-children as the state-flower (which — for obvious reasons — *Rhododendron* should be!), is noted in pencil — "Variety *velutina*, has two of its petals *very dark purple* and velvet-like." This is the variety *bicolor*, Pursh, of to-day —

which I myself have never seen. The late George Thurber once wrote me that in cultivation it became as large and handsome as a pansy.

Two localities of the butterfly-weed, *Asclepias tuberosa*, L., are given, and are interesting as carrying this plant so far back in our Rhode Island record. There has been a modern belief that it was introduced from the West. My father's localities are "Utacognut Hill" to-day called "Neuticonquinut," and North Providence. The last is very indefinite. It occurs to-day from Manton to Kingston. *Gentiana crinita*, always a special favorite of my father's, is noted as growing in Providence near the Friends' School, a still possible locality, the days of which are limited. However, fortunately there are a number of other spots. *Hydrocotyle umbellata*, L., grew at Mashapaug Pond. I wonder if it does now! It is a plant that I associate with more distant localities, say in South Kingston and Little Compton. Another umbellifer, *Crantzia lineata*, Nutt., is recorded as abundant near Providence. No doubt it still is. It is a plant that is, as Mr. Mantalini would say, "demd damp, moist, and unpleasant," and one has to search for it in muddy, oozy flats at low tide. Indeed, I often gauge a man's enthusiasm for field-work by the number of aquatics he has pulled in. It takes pluck to study *Potamogeton*, *Naias*, *Zannichellia Zostera*, and the like.

The Grass-of-Parnassus, *Parnassia Caroliniana*, Michx., bears the legend "Banks of the Woonasquatucket." This is one of the two rivers originally flowing into the cove in the middle of Providence, and there uniting to form the so-called Providence river, into which the Seekonk also flows. The latter is the continuation of the Blackstone below Pawtucket. An additional locality for the last plant is "Near Centre Hotel, August 31, 1830." The long-leaved sundew, *Drosera intermedia*, Hayne, var. *Americana*, DC., is recorded as *Drosera longifolia*, L. It occurred in a swamp near the Douglas turnpike, "about four miles from Providence." This may now be in the city limits. The Turk's-cap lily, *Lilium superbum*, L., grew, as it has till recently, in Moses Brown's meadow, viz. in the region between Angell Street, and Cat Swamp; the red lily, *L. Philadelphicum*, L., from the same locality, where I, too, have always found *L. Canadense*, L. My father, however, notes the latter from "Trip-town, R. I."

Then, as now, *Medeola Virginiana*, L., flourished in "The Grotto." In my day it has been equally abundant in the ravine in Blackstone Park and the grove to the east of the Metcalf Botanic Garden of Brown

University. Indeed, our University is very fortunate to obtain on its own ground so many desirable wild plants. It is a plot of very diverse soil and moisture, now being properly laid out and planted.

The nodding *Trillium* has " The Grotto " as a station. This is the very beautiful ravine and stream so long included in the estate of the Butler Hospital for the insane.

Of *Rhododendron maximum*, L., my father writes — " Said to grow in Attleboro." Query — *does it?* Did he not know then, as he certainly did later, of the magnificent growth of it at Wickford and in South County?

Cassia Chamaecrista, L., abounds in the sandy regions of Rhode Island quite up to the city. The smaller species, *C. nictitans*, L., not included in Bigelow's book — though surely it grows in Massachusetts — is mentioned as occurring in abundance near Mashapaug Pond. It is curious to read the description in pencil, " July, August. Spreading, pubescent. Leaves in many pairs, linear; glands of the petiole pedicelled; peduncles short, supra-axillary. 2- or 3-flowered." *Cassia Marilandica*, L., grew in plenty about " Moses Brown's meadows," — my own original locality, found years after, without consultation with this record. These localities about Moses Brown's old farm should be especially noted, for the city is fast encroaching upon them. Where less than ten years ago were open fields, and grassy lanes, are now curbed streets and numerous cottages. Sewers, too, are draining the entire region.

Rhodora is not mentioned as from Rhode Island, nor is *Moneses grandiflora*, Salisb., now both known to occur. Indeed, *Rhodora* grew within my own active collecting period in what is now the tenth ward of the city. *Moneses* is found in Smithfield. My father has no record, either, of S. F. Olney's locality for *Linnaea borealis*, L., the only one ever known in the State, near Silver-spring bleachery. The station has been obliterated some twenty years. If any one knows of another, he is requested to speak up.

The white Indian-pipe, *Monotropa uniflora*, L., is checked as from " Tifft's woods." Among the crow-foots is found *Ranunculus Cymbalaria*, Pursh, where I have myself always found it, along the Seekonk, date, August, 1834. Thirty-two years between the dates of record of father and son.

The scarlet painted cup, *Castilleia coccinea*, Spreng., is growing scarce near the city. In those old days it occurred at Trip-town.

Epiphegus Virginiana, Bart., grew as in our own time, in "The Grotto." I would extend the finding to almost any beech-grove in the State. The only Gerardia recorded is *G. tenuifolia*, Vahl., as found near the Woonasquatucket river, Aug. 14, 1830. This does not necessarily mean within the city, though even now it is abundant at a place remote from that cited, viz., beyond Cat Swamp. It is rather curious that there is no mention of the four or five others, including *maritima*, all within the lines of our city.

The localities of Orchids are always interesting. We find *Habenaria blephariglottis*, Torr., turning up in those days at Mashapaug Pond, and — still more interesting — "near Sandy Bottom at the head of Providence Cove, August, 1830." Fancy it now, ye loiterers at the new station, which occupies the position of the once limpid — and later, putrescent — Cove! This beautiful native grew on a spot now defiled by ashes and garbage — and where toil the Italian scavengers, neither do they spin!

Habenaria lacera, R. Br., is marked "Dyer's pasture" — a location I fail to identify — and *H. psycodes* at Trip-town. This local name has also vanished from the map. Where, too, were "Tifft's woods" then the home of *H. fimbriata*, R. Br.? In my time it has occurred in Olneyville. *Arethusa bulbosa*, L., I am delighted to note, was observed in Cat Swamp, June, 1832. It was true to this record certainly as late as 1890. *Pogonia ophioglossoides*, Nutt., was always found there, but there is no check against *P. verticillata*, Walt., a choice orchid, which still turns up in town. Some years it is brought me by a number of people, — and from various stations.

Of course the lady's slipper, *Cypripedium acaule*, Ait., was prevalent, as it is now, in all sandy woods. It prevails especially in the tenth ward, formerly in the town of North Providence. The locality given for *Corallorhiza odontorhiza*, Nutt., is "The Grotto."

In 1830 wild rice, *Zizania aquatica*, L., grew, as it still does, "in the wet land at the head of Providence Cove, where its tall reed-like stems, swaying in the wind, and its feathery plumes, are fair to see.

Under *Myriophyllum procumbens* — what is it now? — my father has this note, "Leonard's Pond, N. Providence, fence leading from a white house on the Louisquisset Turnpike, strikes the shore of the pond at a spot where the *M. p.* grows abundantly, August, 1837." Probably of the items here mentioned, pond, town, house, fence, road and plant; only the road and the pond survive. However, the plant

may, perhaps, be found there, being an aquatic and not subject to certain topographic disturbances, which would extinguish all things terrestrial.

While little is said about Lycopods and ferns — we find this intensely interesting note concerning *Lygodium palmatum*, Swartz., my own station for which is South Scituate, R. I.

"*Lygodium palmatum* — abundant on banks of Tar Kiln River, near Douglas Turnpike, R. I., July 4, 1834." It would be well worth while to look up this long-forgotten locality — and then, in the interests of science, again to forget it!

Brown University.

DICKSONIA PILOSIUSCULA, var. CRISTATA.

George E. Davenport.

Having recently visited the type station for *Dicksonia pilosiuscula*, Willd., var. **cristata** (*Daenstedia punctilobula cristata*, Maxon) in company with Mr. F. G. Floyd, who first brought this fern to notice, I have been able gradually to recall quite clearly the circumstances under which I saw it for the first time in 1873. I had not at that time taken up the study of ferns, but was more interested in the flowering plants, consequently I did not pay that attention to this form of the Dicksonia that I otherwise should have done, and the circumstance itself passed out of my mind until Mr. Floyd's discovery recalled it.

I had been botanizing on the Great Blue Hill in company with the late veteran botanist, Mr. E. H. Hitchings, and, while following one of the brook ravines down from the summit of the hill, we came across this patch of bifid and crested Dicksonia. I now recall very clearly our stopping sometime to look at it, and commenting on the somewhat unusual occurrence, but, as we were after other things, and as neither of us at the time had any special interest in ferns, we made no collection of it, and I imagine it passed out of Mr. Hitchings' mind as it did out of my own.

The variation is interesting and difficult to account for. The plants are restricted to a small area, and the variety is intermixed with the normal form in such a manner as to suggest their both being attached to the same rootstock. Mr. Floyd and I, however, took up

very carefully several clumps in order to investigate this, but in each case they separated readily into two distinct plants, the normal form being on one rootstock, and the variety on the other.

My object in publishing this note is to show that there is every presumption in favor of believing that the form has persisted in maintaining its character for more than twenty-five years, long enough surely to justify recognizing it as a permanent variation from the normal character of the species.

It is not so easy, however, to account for the variation, as there is absolutely nothing in the plant's environments to suggest an explanation, both forms being closely intermingled, and therefore exposed to precisely the same conditions; probably at least one half of the whole patch showing bifid and crested apices to the fronds and pinnae.

Medford, Massachusetts.

NEW STATION FOR THE DWARF MISTLETOE.

J. C. Arthur.

The remarkable number of recent coincident finds of the dwarf mistletoe (*Arceuthobium pusillum* Peck) reported in the January Rhodora of this year, makes the discovery of another New England station in itself of small moment. It was my good fortune this past summer, however, to chance upon a more luxuriant and abundant development of the plants than any so far recorded. It was while spending some weeks at Isle au Haut, Maine, that I came one day upon a portion of forest along the shore, of a few acres in extent, composed almost entirely of white and black spruces in about equal proportion, which presented an exceedingly novel and almost fantastic appearance. The general effect was that of an abandoned Italian garden, with its once compact and well clipped forms, now ragged and partly dead. Here and there witches' brooms of characteristic form, from a foot to three feet in diameter, were prominent, but it was the transformation of whole trees from the smallest size to thirty or forty feet in height into solid individual "brooms" that produced the strangest effect. Trees ten to fifteen feet high and of two-thirds that diameter were most numerous, and were formed of a close growth of slender branches from the ground to the rounded summit, the usual pyramidal form being entirely lost.

The mistletoe was not equally in evidence on all trees showing equal transformation. On some it was produced sparingly, but on others it stood so high and thick on the branches as to hide the leaves and give a brown look even at some distance, the general effect being softened, however, by the green of the youngest twigs. The foliage of affected trees was usually of a paler and more yellowish green than the normal, but the comparatively few dead and dying trees showed that the mistletoe, although exhausting, was not so destructive a parasite as one would fancy.

Isle au Haut is about the outermost island at the mouth of Penobscot bay, and fifteen to twenty-five miles from the mainland, although many small islands with spruce trees intervene. The locality here described is at Douglas (locally called Rich's) cove, on the east side of the island looking toward the open ocean. The island, which is about six miles long and about half as wide, is well wooded throughout, chiefly with spruces and birches, and rises along the central line to over five hundred feet elevation, making the whole island into a miniature mountain range rising from the sea. The fogs roll in from the open ocean and envelop the eastern slope at all seasons, but excepting in severe weather they are intercepted by the central summits and burned off before reaching the western shore, thus making a decided difference in the atmospheric humidity of the eastern and western slopes. To this difference in humidity, as suggested by Dr. von Schrenk, I am inclined to ascribe the fact that in my subsequent search, while I was able to find the mistletoe on the western slope of the island, it was never in sufficient luxuriance to cause witches' brooms or even noticeable fasciation of the branches. On the eastern slope only one area was found in which the majority of the trees were affected, but outside this area witches' brooms of conspicuous size were not uncommon.

I probably found more of the white spruce (*Picea Canadensis* B. S. P.=*P. alba* Link) affected than of the black spruce (*P. Mariana* B. S. P.=*P. nigra* Link), but I could see no indication of discrimination by the parasite. I was more especially impressed with this observation, as the two spruces are similarly affected by climatic conditions, and have much darker foliage than when growing inland, in large part being of the same deep blue-green as the balsam fir (*Abies balsamea* Mill.), altogether making it difficult to distinguish them from each other except by a close scrutiny of the youngest twigs to detect

the presence or absence of pubescence. And furthermore, throughout the island the black spruce is attacked by a species of *Peridermium*, which forms large compact witches' brooms that are very conspicuous on account of their pale yellow color, and yet the white spruce is never affected by the fungus. Why the fungous parasite should discriminate between two host species resembling each other so closely in every prominent character, while the spermophytic parasite does not, seems a curious matter, beyond explanation.

PURDUE UNIVERSITY.

ABNORMAL FLOWERS IN LEONURUS CARDIACA.

C. H. BISSELL.

LAST summer, in looking over a colony of the common "Motherwort," growing by the roadside, I noticed several plants of unusual appearance. Examination showed that the peculiar aspect of these plants was due to a variation in the flowers, and that these presented an interesting transformation by which the stamens are changed to leaves (phyllody) and the corolla becomes less irregular (peloria). Both the form and color of the corolla were abnormal. In place of the usual arched upper lip, capped by a conspicuous tuft of white wool, was a shorter, entire, somewhat lanceolate lobe. The lower lip was also smaller than usual and provided with pointed lateral lobes. The color was paler than usual and had a greenish tint. The most conspicuous variation, however, was in the anthers, these being changed into leaf-like, green appendages.

In looking up the literature of this species with special reference to its teratology, I find several anomalies described, but none which exactly covers this case. For instance, Freyhold[1] states that small leafy tufts are sometimes formed between the calyx and corolla in this species, although he does not record a change in the stamens. A case of peloria in *L. Cardiaca*, L., has been described by J. Peyritsch,[2] and illustrated by plate. His figures show a calyx with six unequal teeth, a corolla with six short, rounded equal lobes and six stamens with perfect anthers. Peloria is shown only in the upper flowers of his plant, the lower being of the usual form.

[1] Freyhold, Beiträge zur Pelorienkunde, 3–14; Strasburg, 1875.

[2] Denkschr. der k. k. Acad. der Wissensch. (Mathem. Cl.) xxxviii. Abt. 2, 134–148, t. 5; Vienna, 1878.

Our plant differs in many ways from this. The calyx is normal, and the corolla, although much modified, is still two-lipped, while, as stated, the most important variation is in the anthers. Furthermore, no flowers of the normal form were found on the same plants. Masters,[1] in treating of phyllody, states that this occurs less frequently in the stamens than in the neighboring organs; that sometimes the whole stamen is affected, at other times only a part; that the change of the anther from its ordinary condition to that of a leaf, indicates a great degree of perverted development. He gives a list of species in which phyllody of the stamens has been noted, but does not mention any species of the order *Labiatae*.

In all the flowers of our plant the anthers are changed to leaves, varying somewhat in form, and in some cases the leafy growth extends downward on the filament. The style and stigma of these flowers seemed normal and perfect, but were, so far as observed, abortive, and did not produce seed, although surrounded by an abundance of flowers with perfect anthers. Unfortunately, notes as to this point were not as extended as desired, owing to the untimely mowing off of the colony under observation.

The accompanying figure of one of the flowers is from a drawing kindly prepared by Mr. Charles E. Faxon. The modified stamens are shown at *st.*

Southington, Connecticut.

Autumnal flowering of Vaccinium pennsylvanicum. — It was an interesting experience in the middle of September to find in a deserted overgrown timber-road near Westford, Massachusetts, a quantity of the early low blueberry, *Vaccinium pennsylvanicum*, covered with blossoms. The unusual effect of the buds and blossoms, among the old leaves, suggested the southern evergreen species, *Vaccinium for-*

[1] Vegetable Teratology, 253–256.

mosum. Later in the month, a few scattered plants of *V. pennsylvanicum* were found in bloom near Lake Minnewaska, Ulster County, New York. I am told that, though one often finds violets, and other spring-flowering herbs blossoming again in autumn, this tendency is unusual with shrubbery plants; and I remember finding nothing of the kind before, though often in the woods in September and October. Can it be the result of the unusually dry weather? — M. A. Coe, Brookline, Massachusetts.

A new Vicia for New England. — In the early summer of 1895, Miss Patterson, one of my pupils, brought me specimens of a *Vicia* collected in a roadside ditch, in the outskirts of this village. I did not examine it critically, but took it for a rank form of *V. sativa*, L., and so recorded it in my note-book. Last summer I collected it from the same station and, doubtful of its identity, sent specimens to the Gray Herbarium, where Dr. E. B. Uline determined it as *V. sepium*, L., a species generally distributed in Europe. Another American specimen in the Gray Herbarium, was collected by L. R. Jones in a meadow at Montreal, in 1895.

Vicia sepium differs from *V. sativa* chiefly in the following characters: flowers 2–5, in sessile clusters or short racemes, the individual flowers on short pedicels; leaves large, ovate or ovate-oblong; pod comparatively short and broad. — Herbert E. Sargent, Brewster Free Academy, Wolfboro, New Hampshire.

A new variety of Zizia aurea. — On a botanical trip last June, at Salisbury, Connecticut, a field was crossed in which were many plants of "Golden Alexanders." In this species, the leaflets are usually at least twice as long as broad, tapering to a point, and sharply toothed. Here, however, were individuals with leaflets nearly as broad as long, very blunt, and with shallow teeth. They were growing with, and otherwise seemed like the typical form, yet the variation is so striking, that it seems worthy of a name and description, as follows:

Zizia aurea, Koch, var. **obtusifolia**, n. var. Leaflets 2 to 4 cm. long, from obovate to broadly oblong, mostly rounded or even retuse at the apex, closely serrate with shallow teeth. — Low fields, growing with the typical form, Salisbury, Connecticut, 19 June, 1900. Type specimen in the Gray Herbarium. — C. H. Bissell, Southington, Connecticut.

Solidago tenuifolia a weed in Rhode Island. — Several persons call my attention to the prevalence in Rhode Island of *Solidago tenuifolia* as a weed. It is locally known as Jemimy weed, and is said to have first attracted attention about the time that Jemimy Wilkinson left Central Rhode Island. It was considered "a curse put upon the country for a repudiation of her doctrine."

A correspondent, Mr. W. H. Bennett of Apponaug, from whom I derive this information, says: "No animal will attempt to eat it, and it spreads with great rapidity. Nothing but persistent pulling will ever keep it down. It is even now increasing all over pasture and waste lands, and bids fair to crowd out all else."

Mr. J. F. Collins and I, in 1894, noted its prevalence on Block Island. — W. W. Bailey, Brown University.

We have received a little four-page circular entitled Notes on the Flora of Hartford, Litchfield and Tolland Counties [Connecticut], by A. W. Driggs of East Hartford. The circular is dated September 1, 1900, but, unfortunately, no place of publication is mentioned. In it are recorded notes on the local distribution of fifty spermophytes and pteridophytes, a few of them species not included in Bishop's Catalogue of Connecticut Plants. The circular can presumably be obtained from its author.

Mr. H. K. Morrell publishes in the Gardiner (Maine) Reporter Journal for June 18, 1900, a vigorous appeal for the extermination of the King Devil Weed, *Hieracium praealtum*, "the worst pest ever introduced in Maine"; and suggests that every landowner in the region infested by this weed ought to keep it from his own grounds, and that the State should take active measures toward the eradication of the plant where it now has a foothold. "Within four years it has spread from the old Bartlett and Dennis field in West Gardiner, till now Randolph, Chelsea, Farmingdale, and West Gardiner are pretty badly infected with it, and it is spreading into Richmond, Gardiner, and Litchfield."

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POLYEMBRYONY IN SPIRANTHES CERNUA.

R. G. Leavitt.

In the seed of *Spiranthes cernua*, I find that there is ordinarily more than one embryo. When this fact was first noticed, it was suspected that the occurrence might be local; inasmuch as, while the polyembryony is seen from a glance at the seeds or ovules at almost any stage, the case seems not heretofore to have been reported. Curtis (Bull. Torr. Bot. Club, vol. xx., p. 188) figured the seed, and he found but a single embryo. Material from a distance, however, kindly sent to me from Webster, Massachusetts, by Mr. L. J. Spalding, and from Toronto by Dr. Jeffrey, shows the same condition as the local material. Seed out of an herbarium specimen from Iowa is likewise polyembryonic.

Two spikes collected respectively in Melrose and in Beverly, Massachusetts, showed single embryos. One of these spikes was labelled "flowers yellowish." I have found a small plot of plants that have, also, a normal embryology. All these latter plants are vigorous specimens, and might perhaps be referred to the yellowish variety, if such a variety may be distinguished. Other plants characterized by long and dense spikes and yellow-tinged flowers have, however, displayed the polyembryonic trait.

The normal embryology — of which, with the abnormal, I hope soon to publish a fuller account — is interesting. The sexually derived embryo develops no suspensor at the micropylar end of the embryo-sac. It early establishes a connection with the opposite extremity, and from that quarter draws its nourishment. I may mention that I have readily found the pollen tubes applied to the embryo-sacs at the time of fertilization, and masses of empty tubes persisting in the

ovaries sectioned, even after the embryos are well along; this, in contrast to what I have noted in polyembryonic ovaries.

In the prevalent, abnormal development the inner integument of the ovules displays an extraordinary growth and tendency to form embryogenic masses even before the embryo-sac is mature. Indeed the sac seems ordinarily to be pushed aside by the adventive growths, and probably becomes functionless. I have rarely found traces of pollen tubes in the ovaries. In a test made to determine the ability of the plant to produce its polyembryonic seed under conditions absolutely excluding fertilization, I have, at the time of writing, got so far as to find adventive embryos of nearly the normal size. From present appearances I judge that the seed borne under test conditions will not differ from that ordinarily produced.[1]

The adventive embryos number from one to five or six. When several occur together, some are sure to be smaller than others. Even when solitary, an adventive embryo is readily distinguished from an egg-derived embryo in lacking the slight apical protuberance which serves the normal germ as suspensor — or at least as haustorium. In my observation, adventive and normal embryos do not occur in the same pod, or even upon the same plant.

The embryonal tissue is apt to grow so vigorously as to distort and frequently to rupture the seed. It is common to find large, rounded, embryo-like masses outside the micropyle, connected by a chain of richly protoplasmic cells to the nourishing region at the end of the seed.

The forms of the embryos vary from spherical to elongate; not rarely irregular and lobed examples occur. The lack of uniformity in size, shape, and position of the embryos in the seed is in consonance with the irregularity in all respects characterizing this mode of reproduction.

The Ames Botanical Laboratory, North Easton.

[1] Since the above was written the pods of the plant under observation have come to maturity with an abundance of seed full of embryos of the usual size and formation.

FERNS OF A DEEP RAVINE IN THETFORD, VERMONT.

A. LeRoy Andrews.

A locality in the township of Thetford, Vermont, furnishes within a limited space such a variety of ferns, including several which are found very rarely, if at all, in the vicinity, that I am persuaded to attempt a brief description of it.

A deep, narrow ravine or gully cut in the side of a high hill, becomes in spring the bed of a small drainage brook, which later, however, becomes dry. Steep, rocky walls, clothed in a growth of forest, close out effectually the rays of the sun, producing that indescribable effect of forest twilight which we associate with the growth of certain species of ferns. In every available place is collected a thick deposit of vegetable mould. Here the ferns revel in a luxuriance that, in spite of a remarkably dry season, is hardly short of tropical. They fringe the overhanging rocks, adorn every fissure, grow in immense feathery clumps of graceful fronds at the bases of the cliffs and along the brook-bed — a garden of ferns such as one seldom sees.

But the interest is not wholly on the side of the æsthetic, — the botanist also comes away well rewarded. A canister of specimens furnishes the means for an interesting comparison and study.

The species with their distribution are as follows: From the rocky pastures above straggle down large beds of *Dicksonia pilosiuscula*, in varying shades of light and dark green. The other species, uniformly distributed on the steep slopes, are *Aspidium marginale*, *A. acrostichoides*, *Pteris aquilina*, *Phegopteris Dryopteris*, *P. polypodioides*, with occasional sterile fronds of *Onoclea sensibilis*. Upon the flat tops of rocks grow little colonies of *Polypodium vulgare*, while delicate bunches of *Cystopteris fragilis* (apparently the season's second growth) cluster beneath them, rarely showing fertile fronds. In the accumulation of damp mould along the brook-bed grow the species deserving especial mention. Mixed in charming contrast of form and tint are large clumps of *Aspidium marginale*, *A. spinulosum*, var. *intermedium*, *A. Goldianum*, *A. aculeatum*, var. *Braunii*, *Adiantum pedatum*, *Asplenium thelypteroides*, *A. angustifolium*, with specimens of *Botrychium Virginianum*, while the outlet of the ravine is marked by a thicket of tall fronds of *Onoclea Struthiopteris*.

The three species, *Aspidium Goldianum*, *A. aculeatum*, var.

Braunii and *Asplenium angustifolium* were hardly to be expected here, and careful search has failed to reveal them elsewhere in the vicinity. All are species of the deep woods of mountainous regions, the station for *Asplenium angustifolium* being close upon the eastern limit of its range in New England, and that of *Aspidium aculeatum*, var. *Braunii* one of comparatively few in New England, the others being mostly confined to the White and Green mountains, or to more northern mountainous localities. Thetford, situated on the Connecticut River, is not at all mountainous, possessing only a few hills with isolated patches of woods. The ferns of the ravine, which I have described, represent then, apparently, the few survivors of a primitive, uniformly wooded condition, and will themselves undoubtedly soon succumb to the already threatened deforestation of their home.

Since writing the above, further observation reveals a single plant of *Aspidium acrostichoides*, var. *incisum*. The plant is noticeably distinct, with thicker, very dark green fronds, large, deeply-incised pinnæ, and the fruiting dots occurring in small numbers on each pinna, separate, and in no case confluent or covering the pinna. President Brainerd of Middlebury kindly confirmed my identification.

Thetford, Vermont.

TWO NORTHEASTERN THALICTRUMS.

M. L. Fernald.

(Plate 21.)

Late in June, 1899, the Josselyn Botanical Society of Maine spent a forenoon exploring the south bank of the Aroostook river at Fort Fairfield, Maine. Among the more striking discoveries was a delicate meadow-rue first detected by Miss E. L. Shaw in the alluvial thicket below the village, and afterwards found in abundance, by other members of the party, in the thicket which, along the Aroostook (as well as the St. John), forms the boundary between the steep wooded bank and the gravelly beach of the river. The *Thalictrum*, then in bloom, was a dioecious or slightly polygamo-dioecious species, suggesting in its flowers, and its thin glaucous foliage, the early meadow-rue (*T. dioicum*) of southern New England. The stems of the Aroostook valley plant, however, were much taller, often 1 m. high, bearing from three

to five large leaves and some smaller ones in the inflorescence. The rootstock of the plant, furthermore, was slender and elongated, very unlike the short thickish caudex of *T. dioicum*; and while the flowering season of this northern plant was just beginning, the fruit of *T. dioicum* in southern Maine and Massachusetts was already past maturity. The plant was obviously distinct from the recognized New England species; and it was pronounced by Professor John Macoun, who was in the party, unlike any species known to him in eastern Canada. The immature condition of the material, however, rendered a final determination of the species impossible.

During the following September an unsuccessful attempt was made by the writer to secure fruit from the Fort Fairfield plants. Somewhat earlier in September, 1900, a visit was made to the St. John valley, where plants very similar in appearance to the Fort Fairfield species were seen in abundance in the thicket between the river-beach and the high wooded banks. These plants on the St. John were invariably past fruiting, as they were likewise at the original station at Fort Fairfield. About two miles from Miss Shaw's station for the plant, however, a single specimen, scarcely 4 dm. in height, was found in fine fruit. Severe early frosts had injured the plant for herbarium purposes so that after the fruit had been gathered the stem and leaves were inadvertently tossed into the river. On second thought, however, the rootstock was carefully dug and examined, when it proved to be not elongated and slender as in the plant for which it had been mistaken, but short and thickened, much as in *T. dioicum*. Upon returning to the Gray Herbarium it was found that the achenes of this plant were unlike those of any described species of the genus, and that the smaller plant of the Aroostook valley must be a second species unrecognized in our New England flora.

In Macoun's Catalogue of Canadian plants, and in Fowler's Catalogue of the plants of New Brunswick, numerous stations for *Thalictrum dioicum* in the St. John valley are cited, and the plant is also reported from "flat lands" on the Restigouche, while *T. purpurascens* is reported from numerous stations in Nova Scotia and from Anticosti. An examination of the material in the herbaria of the Canadian Geological Survey Department and of the Natural History Society of New Brunswick, kindly placed at the disposal of the writer by Professor John Macoun and by Mr. Geo. U. Hay, shows that these plants are in the main identical with the larger species recently discovered on the Aroos-

took. In these herbaria the tall plant, found in flower at Fort Fairfield by Miss Shaw, is well represented by fruiting material which proves it beyond a doubt to be *T. occidentale*, Gray, a species characteristic of the mountains of British Columbia, Washington and Oregon, rarely found eastward to the Rockies. So far as the herbarium material shows, the Nova Scotia and the Anticosti plants are both good *T. polygamum*, rather than *T. purpurascens* with which they have been placed. A fruiting specimen from the mouth of the Restigouche, reported in the first part of Macoun's Catalogue as *T. dioicum*, has subsequently been treated by Professor Trelease as a probable hybrid between that species and *T. purpurascens*. But that this disposition of the plant is far from satisfactory may be seen from the fact that the Restigouche specimen comes from a region 230 miles northeast of the nearest authenticated station of *T. dioicum*,[1] and some 450 miles from the northeastern known limit of *T. purpurascens*. The plant is, however, identical with the larger species of the St. John and Aroostook valleys and it matches perfectly *T. occidentale* of the Northwest.

The smaller *Thalictrum*, of which fruit was obtained at Fort Fairfield during the past September, is beautifully represented in the herbarium of the Geological Survey Department of Canada by a sheet of flowering specimens collected by Professor Macoun in thickets at Ottawa in August, 1894. In habit this plant strongly suggests small-leaved forms of the Rocky Mountain *T. Fendleri*, but that species has elongated rootstocks and strongly compressed achenes; while in the northeastern plant the caudex is short, and the short, plump achenes terete. This plant, as already stated, can be referred to no species of America nor of the Old World, and it is here proposed as

Thalictrum **confine.** Rootstock 2 to 4 cm. long, bearing 10 to 12 strong roots: stem slender, 3 to 6 dm. high, puberulent, pale green, often finely mottled with purple, leafy to the summit: the four or five leaves glandular-pruinose, glaucous beneath, the lower including the long petiole 1.5 to 2 dm. long, the uppermost including the short petiole 3 or 4 cm. long; leaflets suborbicular broadly obovate or flabellate, coarsely toothed, 0.75 to 1 cm. long, the terminal on slender petiolules, the lateral short-

[1] K. C. Davis (Minn. Bot. Studies, Ser. 2, 515) credits this species to Labrador, but the occurrence of the plant in that district is seriously doubted. The only Labrador specimen so named in the herbarium of the Geological Survey Department of Canada is clearly *T. polygamum*.

petiolulate or subsessile: flowers dioecious, greenish or purplish, the panicles 1 or 2 dm. high, with ascending branches: sepals greenish, oblong-lanceolate, caducous: carpels 6 to 10, glandular-pruinose; stigmatose style lance-subulate, 3 to 5 mm. long; achenes ovate-lanceolate, excluding the persistent style, 4 or 5 mm. long, 2 or 3 mm. thick, plump, subterete, scarcely compressed or ancipital, with 8 simple or slightly branched strong ribs, the alternate ones strongest; seed linear-lanceolate, hardly filling the cell.—Alluvial thickets, ONTARIO, Rideau Hall, Ottawa, in flower, August 8, 1894 (*John Macoun* in herb. Geol. Surv. Dept. Canada, no. 2,956): MAINE, by the Aroostook river, Fort Fairfield, in fruit, September 19, 1900 (*M. L. Fernald*).

The characters and eastern stations of the larger plant may be summarized as follows:

T. OCCIDENTALE, Gray. Rootstock slender, elongated: stem glabrous, 1 m. or less high, leafy to the summit, the three to six leaves glaucous beneath, smooth or minutely glandular, the lower including the long petiole 1 to 2.5 dm. long, the uppermost including the short petiole 0.5 to 1 dm. long, those of the inflorescence often simple; leaflets thin, reniform or obovate, with coarse rounded lobes, the terminal on slender petiolules, the others short-petiolulate or subsessile: flowers dioecious or polygamo-dioecious, greenish or purplish, the panicles 1.5 to 3 dm. high, with ascending branches: sepals oblong: carpels glabrous or minutely glandular-pruinose; achene excluding the persistent style 6 or 7 mm. long, 2 or 3 mm. wide, compressed, strongly ancipital, with three strong somewhat branching ribs on each side: filaments, yellowish greenish or purplish, elongated, slightly clavellate; anthers linear, mucronate.—Proc. Am. Acad. VIII. 372. *T. dioicum* × *purpurascens*, Trelease in J. M. Macoun, Can. Rec. Sci., 1894, 77.—NEW BRUNSWICK, woods ("flat-lands," Fowler's Catalogue), Eel River, Restigouche Co., in fruit, July 29, 1876 (*R. Chalmers* in herb. Geol. Surv. Dept. Can. no. 844); South Tobique Lakes, July 18, 1900 (*G. U. Hay*); along the St. John river above Woodstock, in flower and young fruit, July 3, 1899 (*John Macoun* in herb. Geol. Surv. Dept. Can. no. 21,136); St. John, in fruit, Aug., 1890 (*G. U. Hay*): MAINE, thickets by the Aroostook river, Fort Fairfield, in flower, June 29, 1899 (*Miss E. L. Shaw* and others of the Josselyn Botanical Society of Maine); MANITOBA, Lake Winnipeg valley, 1857 — previously referred to *T. dioicum* (*Bourgeau*): Montana, Wyoming and westward.

GRAY HERBARIUM.

EXPLANATION OF PLATE 21. — *Thalictrum confine*, drawn by C. E. Faxon from original material. Figs. 1 and 2, fertile plant from Ottawa; fig. 3, flower of the same; fig. 4, achene from Fort Fairfield specimen.

The fig as a hardy plant in New England. — For some years the edible fig, *Ficus carica*, L., has maintained itself in Providence, Rhode Island, in a suffrutescent state. With its roots deeply buried in the cellar walls of a ruined house, it every year comes up, very late, but thrives vigorously. Finally, it is caught by the autumnal frosts, and all parts above ground perish. I have repeatedly thought I had seen the last of the plant, when suddenly it would again throw up its shoots.

In August of this year, I found *Ficus carica*, L., growing under very similar conditions in a waste lot in Gloucester, Mass. I do not know if it maintains itself through the winter.

W. Whitman Bailey, Brown University.

SOME OBSERVATIONS UPON THE EARLY GROWTH OF IMPATIENS BIFLORA.

C. B. Graves.

It may not be generally known that the common jewel-weed, *Impatiens biflora* Walt. (*I. fulva* Nutt.), at one stage of its growth is an opposite-leaved plant. At any rate there is no mention of this feature in such descriptions of the genus as are accessible to me. That such is the fact, however, is easily seen by examining a patch of young plants in the spring. Following the cotyledons come either three or four pairs of strictly opposite leaves at well-marked nodes. These nodes persist throughout the season, becoming, in fact, much more prominent later, and frequently have opposite branches arising from them. In this young stage the alternate arrangement is to be found only beginning among the very small leaves crowded at the summit. At this time the most conspicuous feature is the distant pairs of long-petioled opposite leaves, and this, with the slender unbranched stem and small size (6 to 15 inches tall in cool woods on May 30 of this year), gives the plants an appearance strikingly unlike that of the late summer specimens.

Another point of interest is the early appearance of cleistogamous flowers. Already, by May 30, in the woods visited on that date, they were uniformly present and young capsules were easily found. By the middle of June — probably earlier — pods were ripe and discharging seeds. They continue to be abundantly produced for at

least a month before petaliferous flowers appear. This past season it was not until July 15 that the first flowers were seen here, and for a week or more after that they occurred only sparingly.

Plants in cool, moist woods may retain their opposite leaves until late July, and very many of them apparently die without ever showing a petaliferous flower. During the remainder of the season, both kinds of flowers are freely produced.

Impatiens in this respect offers a noteworthy contrast with Viola, whose petaliferous flowers always precede and sometimes follow the cleistogenes of summer. From this behavior of Impatiens it seems hardly probable that temperature can be the only factor determining the production of one or the other form of flower, as has been suggested in the case of the violets.

THE NOMENCLATURE OF THE NEW ENGLAND AGRIMONIES.

B. L. Robinson.

Four years ago Mr. E. P. Bicknell[1] published an account of the American species of *Agrimonia*, lucidly distinguishing no less than seven of them, instead of the two commonly recognized in the then current manuals. While Mr. Bicknell's work bears ample evidence of care and accuracy in the botanical observations which he recorded, it fails signally to carry conviction in the matter of synonymy and nomenclature. The following notes, it is hoped, may contribute to a final settlement of our five New England species of this genus.

1 A. hirsuta, Bicknell, Bull. Torr. Club, xxiii. 509 (1896). There can be no doubt from Wallroth's careful and detailed characterization that this is his *A. gryposepala*, published in 1842. To displace this well-described specific combination of Wallroth, Mr. Bicknell takes up the varietal name "hirsuta," published by Muhlenberg in his catalogue. Unfortunately, however, Muhlenberg's plant was not properly described, and *A. Eupatoria hirsuta*, Muhl., is at best a *nomen subnudum*. Now, whatever difference of opinion may exist on the question whether a specific name may be displaced by an earlier varietal name, there can, I think, be only one opinion as to the inadvisability of discarding a name of known and definite application and

[1] Bull. Torr. Club, xxiii. 508–523, t. 282–283.

replacing it by one so vague and obscure, that its original application is a matter of mere conjecture.

Let us see upon just what grounds Mr. Bicknell can maintain the identity of *Agrimonia Eupatoria hirsuta*, Muhl., with the species to which he has applied the name *A. hirsuta* (Muhl.) Bicknell. The type of Muhlenberg's plant is, I learn, either not in existence or at least in a state of confusion with other material, which makes its certain identification impossible. Consequently our sole knowledge of *A. Eupatoria hirsuta*, Muhl., is to be derived from the original description. Muhlenberg's treatment of Agrimonia is as follows:

Calix.	*Corolla.*	DIGYNIA	*Habitat, etc.*
5 fid.	5 pet.	360 AGRIMONIA. AGRIMONY.	Semina 1–2 in calice.
	lut.	1. eupatoria hirsuta ♃ rough-haired.	Pens. fl. Aug. Car.
	lut.	B. glabra ♃ smooth	Pens. fl. Aug.
	lut.	2. parviflora ♃ dotted	Pens. fl. Aug.
	lut.	3. pumila ♃ little	Miss.

A glance at this treatment will show that the description of *A. Eupatoria hirsuta* contains but one distinctive word, "rough-haired."[1] It must have required extraordinary powers of intuition to discover from this one word just which of seven more or less hairy plants Muhlenberg meant by his *Agrimonia Eupatoria hirsuta*, especially as the plant in question, according to Mr. Bicknell's interpretation, turns out to be villous rather than hirsute and is one of the least hairy species of the whole group,— much less so, in fact, than the typical *A. Eupatoria* of Europe. Unfortunately many of us are not endowed with this well-nigh necromantic power, and must accordingly stop in our retrogressive search after priority at the earliest sufficient and intelligible description. To persons of these more modest attainments *A. Eupatoria hirsuta* must be a negligible *nomen subnudum* and *A. gryposepala*, Wallr., be preferred to *A. hirsuta* (Muhl.) Bicknell.

It is true the combination *A. Eupatoria β hirsuta* was also employed by Dr. Torrey and, as Mr. Bicknell informs us, "independently for a more hairy form of the same plant." I have not succeeded in finding the type of this variety in the Torrey herbarium. Concerning the variety we learn from Dr. Torrey's description merely that it was a smaller and much more hairy plant than what Torrey regarded the typical form of *A. Eupatoria*, the latter being probably the very plant

[1] The range including Carolina cannot be regarded as distinctive, since several species are either known to occur in Carolina or from their general distribution are to be expected there.

(*A. gryposepala*) to which Mr. Bicknell has applied the name *hirsuta*. Torrey's *A. Eupatoria* β *hirsuta* has therefore scarcely more definiteness than *A. Eupatoria hirsuta*, Muhl.

2. A. BRITTONIANA, Bicknell, l.c. 510. Suspecting from an examination of authentic material of Mr. Bicknell's new species that it was identical with the plant of Central Europe which has for many years figured as *A. pilosa*, Ledeb., I forwarded some specimens of the American plant to Berlin, where it was subjected at the Royal Botanical Museum to a critical comparison by Mr. J. M. Greenman, who pronounces it in all respects identical with the material there representing Ledebour's species. I have not had an opportunity to have the plant compared with Ledebour's type, but have no reason to doubt the accuracy of the German specimens, especially as Russian specimens of *A. pilosa*, determined by no less an authority than Maximowicz, are clearly the same. Mr. Bicknell says of his species. "*A. Brittoniana* is in fact very distinctive from any American species while nearly related to certain Asiatic forms — *A. viscidula* Bge., *A. pilosa* Ledeb., and *A. Dahurica* Willd., plants which have been variously confused together by authors, and all of which have finally been referred to *A. Eupatoria* L." This is certainly a high-handed way of disposing of a species like *A. pilosa*, which is not only well represented in the larger herbaria, but recognized in such standard works as Nyman's Conspectus, several editions of Garcke's Deutschlands Flora, Thomé's Flora von Deutschland, etc. It is also rather inconsistent with other parts of Mr. Bicknell's work. Surely various names for the American Agrimonies have been much confused, and most of them were referred to *A. Eupatoria*, yet Mr. Bicknell has not hesitated to take them up even when their status, as in *A. Eupatoria hirsuta*, is most vague.

However, there is still an earlier name for Mr. Bicknell's *A. Brittoniana*, as this is just what Michaux described as *A. striata*, a fact suggested to me by Michaux' rather characteristic description, and recently confirmed by a personal examination of the well-preserved type of *A. striata* at the Jardin des Plantes in Paris. The Michaux specimen is in every way a close match for Mr. Fernald's plant from St. Francis, Maine, the latter being Mr. Bicknell's first-mentioned type of *A. Brittoniana*. As a corollary of these observations, attention may be called to the identity of *A. pilosa*, Ledeb., as now interpreted in Germany and Russia, with *A. striata*, Michx., which, as the earlier

name, should be accepted for this species in Europe as well as in America.

3. A. mollis, Britton, Bull. Torr. Club. xix. 221 (1892); *A. Eupatoria γ mollis*, Torr. & Gray, Fl. i. 431 (1840). The earliest specific combination for this plant is *A. platycarpa*, Wallr., Beitr. i. 38 (1842), a name which will be preferred by conservative botanists to the recent combination derived by Professor Britton, from the earlier varietal name *mollis*.

4. A. striata, Bicknell, l. c. 509, not Michx. A significant fact regarding Mr. Bicknell's interpretation of the Michauxian *A. striata* is that its range — "Southeastern New York, and doubtless Connecticut, to Virginia, west to Missouri" — did not include Michaux' type station which was in Canada (presumably Quebec). Had Mr. Bicknell noticed this fact he could scarcely have failed to surmise the identity between Michaux' plant and Mr. Fernald's St. Francis plant from the same general region. The earliest satisfactory name for *A. striata*, Bicknell not Michx., is *A. microcarpa*, Wallr.

5. A. parviflora, Solander. This is the only one of the five species which Mr. Bicknell credits to New England, which appears to me to bear a correct name in his revision.

In conclusion, our New England forms may be synopsized thus:

Roots fibrous, unthickened,
  Principal leaflets numerous, 9 to 15. . . . . . A. parviflora, Solander.
  Principal leaflets fewer, 3 to 7 (rarely 9).
    Bristles of the fruit early spreading.
      A. gryposepala, Wallr. (*A. hirsuta*, Bicknell).
    Bristles of the fruit erect, connivent.
      A. striata, Michx. (*A. Brittoniana*, Bicknell).
Roots fusiform, distinctly thickened,
  Leaflets smoothish . . . . A. microcarpa, Wallr. (*A. striata*, Bicknell).
  Leaflets tomentose beneath. A. platycarpa, Wallr. (*A. mollis*, Britton).

A. gryposepala, Wallr., and *A. striata*, Michx., are rather widely distributed in New England, but *A. parviflora*, *A. microcarpa*, and *A. platycarpa* appear to reach their northeastern limit in Connecticut, and have not, to the knowledge of the writer, been reported from any other New England state.

Gray Herbarium.

THE REPRESENTATIVES OF SCIRPUS MARITIMUS IN AMERICA.

M. L. Fernald.

The bulrush, so abundant in all New England saltmarshes, and characterized by its densely clustered thick brown spikelets and its long moniliform rootstocks with subspherical tubers, has been generally known as *Scirpus maritimus*, L. The species, as it grows upon our eastern coast, presents two marked forms. One, the abundant plant of the New England marshes, has ovate, ovate-oblong or oblong spikelets densely clustered in a head subtended by two or three involucral leaves. The other, sometimes growing with the dense-headed form and often intergrading with it, is characterized by the somewhat branched inflorescence, elongated rays springing from near the base of the dense central head of spikelets. This form with the branching inflorescence is much less common in New England than is the plant with congested inflorescence, but further south it is common, and it occurs also inland and upon the Pacific coast, as does likewise the plant with dense heads. The two forms of the plant are thus of very broad range in America, but, aside from their habital differences, no characters are found by which they can be separated. In their extremes they are strikingly different, but, with very numerous transitional forms and no perceptible differences in the spikelets and achenes, the two plants can be considered only varieties of one broadly distributed species.

In 1803 Michaux described this American plant, or at least the more branching form, as *Scirpus maritimus*, var. *macrostachyus* ("*spicis sessilibus pedunculatisque*"), distinguishing it from the European *S. maritimus* by its thicker spikelets ("*Spiculæ quam in europaea multo crassiores*"). In 1814 Pursh described as a species, *S. robustus*, the large plant ("*spicis oblongis, corymbo composito*") with the note, "certainly specifically distinct from *S. maritimus*, with which I carefully compared it," and in this species he included the var. *macrostachyus* of Michaux.

Subsequent authors, however, treated the American plant as identical with the European *S. maritimus*, and under that name it was known in America until 1892, when Dr. Britton pointed out that the plant of the eastern saltmarshes differed from *S. maritimus* not only in its thicker spikes but in its achenes, those of the European species

being trigonous, while those of the American *S. robustus* are compressed or lenticular. The achenial character seems a constant one in the American plants examined; and this, together with the thicker spike already emphasized by Michaux and Pursh who must have been familiar with the true *S. maritimus* of Europe, sufficiently distinguishes *S. robustus* of Pursh from the Linnean species with which it has been confused. Some specimens from our Pacific coast are doubtfully referred by Dr. Britton to the true *S. maritimus*, but no mature achenes have been examined, and for the present the status of that species in our flora must remain doubtful,

In the Illustrated Flora Dr. Britton describes as *S. robustus* the plant with spikelets "in a dense, often compound, terminal cluster." This, as already stated, is the commoner form of the plant on our northeastern coast, but the form obviously intended in the descriptions of both Michaux and Pursh is the one with definitely branching inflorescence. In the same work Dr. Britton describes as a species, *S. campestris*, a rather characteristic plant of the Great Plains and Rocky Mountains, with exceedingly light-colored spikelets. Except for the rather inconstant color character, this Great Plain plant does not differ, however, from the dense-headed plant of the coastal region.

In 1899 Professor Aven Nelson published as a species, *Scirpus paludosus*, a Wyoming plant similar to *S. campestris*, Britton, "from which it is clearly separated by its remarkable tubers (subspherical, 10-25 mm. in diameter)," as well as by its darker scales and achenes. Comparison with specimens from Professor Nelson shows that his species is in no way different from the common American plant with brown spikelets in dense terminal heads. Furthermore, *S. paludosus* instead of differing from *S. campestris* in its "remarkable tubers" is very like that plant (as shown by herbarium specimens) in this point—a character likewise shared by the European *S. maritimus* as well as our own *S. robustus*.

In his description of *Scirpus campestris*, Dr. Britton emphasized the pale color of the achenes, but an examination of mature achenes shows them often to be quite as dark as in *S. paludosus* and the larger *S. robustus*. With only the pale color of its spikelets to distinguish it from the common dense-headed form of *S. robustus*, *S. campestris* seems much better treated as a Great Plain variety of that species. The identity of Nelson's *S. paludosus* and the common form with congested

spikelets has already been noted; and that the latter plant, as seen on the eastern coast, is only an extreme form of *S. robustus* is well known to students of our saltmarsh vegetation. We have, then, in America three strong tendencies in *S. robustus*, which may be summarized as follows:

SCIRPUS ROBUSTUS, Pursh. Spikelets brown or ferrugineous, oval to oblong, 1.5 to 3 cm. long, 7 to 12 mm. thick, clustered in a subglobose terminal head, and with several elongated rays bearing one to several spikelets; all much exceeded by the 2 or 3 involucral leaves; achenes from obovate to suborbicular, compressed or lenticular, not angled on the back. — Fl. i. 56; Britton, Trans. N. Y. Acad. Sci. xi. 80, at least as to synonyms. *S. maritimus*, var. *macrostachyus*, Michx. Fl. Bor.-Am. i. 32; Gray, Man. 527. *S. maritimus*, in part, of American authors, not L. — Saltmarshes of the coast, New England to Texas and in alkaline regions of the interior (NEW YORK at Salina, *Clinton*; NEW MEXICO, *C. Wright*, no. 1962, in part, etc.), also on the Pacific coast from WASHINGTON (*Piper*, no. 1008) to CALIFORNIA (*C. Wright*, etc.).

Var. **paludosus.** Spikelets brown or ferrugineous, in a dense, rarely compound, head, usually without elongated rays. —*S. paludosus*, Aven Nelson, Bull. Torr. Bot. Cl. xxvi. 5. *S. maritimus*, in part, of American authors, not L. *S. robustus*, Britton in Britton & Brown, Ill. Fl. i. 268, as to descr. and fig. Saltmarshes, abundant on the Atlantic coast from the Gulf of St. Lawrence (?) and New England southward, in the interior at various alkaline stations (Salina, NEW YORK, *Clinton*; SASKATCHEWAN, *Bourgeau*; Cypress Hills, *Macoun*; western DAKOTA, *Leiberg*; Reno Co., KANSAS, *Hitchcock*; Howell Lakes and Seven Mile Lakes, WYOMING, *A. Nelson*, nos. 5312, 6878; Santa Inez Mountains, CALIFORNIA, *Mrs. Cooper*, etc.), and on the Pacific coast (CALIFORNIA, *Hartweg*, etc.).

Var. **campestris.** Similar to the latter, but spikelets straw colored or very pale. — *S. campestris*, Britton in Britton & Brown, Ill. Fl. i. 267. "Manitoba" to Kansas, Nevada, eastern California, and northern Mexico — (Western KANSAS, *Oyster*; NEVADA, Humboldt Sink, *Watson*, no. 1214; ARIZONA, Gila, *Thurber*, no. 687; NEW MEXICO, Rio Laguna, *Marcy Exped.*; CALIFORNIA, Mojave Desert, *Cooper*, no. 2216, *Parish*, no. 1544; SONORA, Horseshoe Bend, 1889, *Palmer*, no. 931).

GRAY HERBARIUM.

Yellow-fruited Ilex verticillata. — In a recent excursion into the country to collect and compare the different forms of *Carya* and *Quercus*, to notice the effects of frost on the foliage, and incidentally to visit the new pumping station for the water supply of the city of New Bedford, located in Lakeville, fourteen miles from the city, I had the good fortune to find something novel and interesting.

On leaving the electric car at Lakeville, I walked down a new road, recently opened through the woods, to the beautiful lake known as Little Quittacus, distant half a mile from the main road. After proceeding about half the way, I espied by the roadside a clump of bushes bearing a bright yellow berry, so unlike any other fruit as to arrest the attention at once. Although but a few scattered leaves remained upon the bushes, they were easily identified as a form of *Ilex verticillata*, Gray, being, in fact, the forma *chrysocarpa*, Robinson, Rhodora, **2**, 106, of which the only previously recorded station is Georgetown, Massachusetts.

In the immediate vicinity there were many bushes bearing the normal scarlet berries, but a thorough search for other specimens of this rare variety was without avail. Passers by had evidently had their curiosity awakened, for a large branch of the golden berries was thrown carelessly by the roadside. This yellow-fruited form of our common black alder is, I find, in cultivation at the Arnold Arboretum, and there, as in its wild state, exhibits an earlier defoliation than neighboring specimens of the typical red-fruited variety. — E. Williams Hervey, New Bedford, Massachusetts.

Polygala polygama, var. abortiva merely an autumnal state. — It is a well-known fact that *Polygala polygama*, Walt., bears normally two kinds of flowers, namely, the conspicuous ones with well-developed corolla, and the small pale or greenish cleistogamous flowers. The former are borne in terminal racemes, while the latter are usually confined to short basal shoots which often push themselves under the leaf-mould or surface soil. In his detailed monograph of the genus Polygala,[1] however, Professor Chodat described as var. *abortiva*, a supposed form of *P. polygama* in which short racemes of cleistogamous flowers arose also from the upper axils, even the terminal raceme sometimes bearing only reduced

[1] Mém. Soc. Phys. Hist. Nat. Genèv. xxxi. pt. 2. no. 3, 280.

and cleistogamous flowers. This form has been observed at various points in New England, and always at places where the typical form is also known to occur. As it presented no difference of foliage, its status as a variety has been subject to suspicion. Some months ago Mrs. H. A. Penniman of South Braintree, Massachusetts, having detected its peculiar character, sent specimens of the variety *abortiva* to the Gray Herbarium. On learning of its doubtful status, she undertook a careful observation of the variety and species as they occurred about her summer home at Brewster, Massachusetts. She has now found that individuals, which during the spring and summer exhibit the character of the typical form, frequently, if not normally, develop, in early autumn, the cleistogamous racemes from their upper axils and become transformed into the so-called var. *abortiva.* This is accordingly shown to be merely a late state of the typical plant, fully analagous, in fact, to the autumnal cleistogamous state of our common violets. Mrs. Penniman's observations are substantiated by an excellent suite of specimens deposited in the Gray Herbarium. — B. L. Robinson.

TRICHOLOMA PORTENTOSUM.

H. Webster.

Among the species of Tricholoma which have come into favor with the mycophagists of eastern Massachusetts is *Tricholoma portentosum* Fries, an edible toadstool which is usually abundant in late autumn, when, as was the case this year, October and half of November pass without the coming of severe frost. Practically confined to pine woods, or at least to woods of coniferous trees, it there appears in such quantities as in many places to alter the look of the needle-strewn ground. At intervals of a few yards the pine needles are pushed up from below in loose heaps, beneath which clumps of the gray-topped mushrooms stand in a measure protected from the frost; or the caps are raised quite through the needles and the thick white or yellowish white stems stand out against the brown background. As the caps are sticky at first, they carry up with them some of the pine needles, which remain firmly attached even after the surface has become quite dry. In woods where the carpet of needles is soft and thick, however, the fungus does not so plainly betray its presence, ex-

cept to the squirrels. They know it, and probably are on the watch for it, for it is one of their regular autumn foods, which they can use while storing away their winter supply of nuts. But for these foragers, who scratch away the pine needles and drag the mushrooms to a convenient mound, where they leave the remnants of their feast scattered about, or who tuck pieces of the caps in the forks of neighboring bushes, or under projecting ends of bark on the trunks of the pines, the fungus might often escape notice. Such evidence should provoke a search, which will always be rewarded, though the searcher may have to drop upon all fours and scratch like the squirrels before he finds what he is after.

Though what has been said ought almost to be enough to make this autumn Tricholoma recognizable, for in the writer's experience, there is no other toadstool, about Boston at least, to which the same remarks would apply, some further note of its characteristics had best be given. As is true of the genus, it has no ring, and its lamellæ, slightly attached to the stem, show the regulation notch or sinus with which anyone who would know Tricholoma must become familiar. The lamellæ are broad, white, often with a tinge of yellow at the outer end; the stem is firm, white, or nearly so, sometimes hollow, especially in mature specimens, but frequently nearly solid, or showing merely a looseness of structure in the interior; the cap is smooth and slightly uneven and irregular, often a little shiny, and beautifully streaked with long innate fibrils that extend outward from the centre and deepen the grayish or brownish violaceous tint of the surface. In the older specimens the thin pellicle bearing these fibrils often becomes a little broken up and ragged, and can easily be stripped clean from the white flesh. The fungus has no odor, or scarcely any, though its taste when raw is slightly farinaceous. It is remarkably free from the attacks of insect larvæ, owing in part, no doubt, to the late season of its fruiting. Its size is from two to four inches broad; the stem is at least half an inch thick, and sometimes double that, and two to five inches long.

Like so many of our agarics, *Tricholoma portentosum* is a species of the Old World as well as of the New, having been studied and described by Fries in the early part of this century. As given by the Swedish mycologist, the European habitat of the species is the same as that described for it in New England, where it is, to use Fries's statement, "a common species in pine woods, growing in late autumn in company with *Tricholoma equestre*." The latter is a brownish yellow

toadstool also with a sticky cap, but with yellow gills, rather conspicuous and distinguished looking, as the name implies, which has likewise become favorably known to discerning mycophagists. Notes on it may be found in RHODORA **1** : 57.

With the species just mentioned *T. portentosum* is placed in the group *Limacina*, which includes all the members of the genus which have a viscid cap. This characteristic is of great significance in this genus, yet apt to be overlooked by a novice in such matters, partly from inattention, and no doubt, also, because it is not always apparent in dry weather. On this point the warning, uttered by Fries (Hymenomycetes Europæi, p. 47), is worth repeating: "Those without experience should be careful not to neglect the very natural sub-divisions of this group, or to imagine that the term *pileus viscid*, though the viscidity may disappear in dry weather, is of slight importance; there is no single mark more essential than this, for it depends upon the original structure of the pellicle of the pileus."

To the neglect of this characteristic is probably due the fact that *T. portentosum* is usually confounded with *T. terreum*, though the latter species has a pileus that is always dry. In consequence of this confusion, it is probable that the range of the species is much greater than might be supposed from its recorded distribution. Fries himself, as late as the time of publication of his Icones, twenty-five years ago, after he had observed the species for fifty years, expressed his surprise that such a "common and thoroughly distinct species" had escaped the notice of earlier authors.

How widely the species is distributed in the country is not at present known. It has been found in New Hampshire as well as in Massachusetts, and I think also in Maine and in Connecticut. Probably it will be found throughout New England. Yet Mr. Peck, in a recent letter to the writer, says that he has not found it in New York.

In Fries's description [Icones 1 : 21.] the following points are noted, which are equally true of the fungus as found with us.

"Solitary or gregarious, or even more rarely forming dense clusters, odorless, taste mild. Stem remarkably fleshy-fibrous throughout, subequal, naked, but streaked with fibrils, white. Pileus fleshy, thin in comparison with the stocky stem, at first convex, then plane, somewhat umbonate, unequal and repand, viscid, streaked with dark innate fibrils, but even, glabrous, commonly smoky in color, but varying to violaceous, livid, and in old age becoming pale; margin always naked, thin. Flesh white, slightly inclining to yellowish, fragile. Lamellæ

rounded, almost free, ¼ to 1 inch broad, distant, at first white then becoming yellowish or grayish-pallid." Fries's figure [Icones, pl. 24], might have been drawn from New England specimens.

It may be added that the spores are white, narrowly oblong-elliptical, 3 to 3¼ μ broad by 4½ to 6 μ long.

Tricholoma terreum Schæff. is a species of the group *Genuina*, characterized by a rough fibrillose or scaly pileus which is never in the least sticky. It commonly shows browner tints than *T. portentosum*, frequently has a strong farinaceous smell, and shows cinereous tints in the lamellæ and on the stem. Placed side by side the two species can easily be told apart by a glance at the pileus, in one case smooth and virgate, in the other rather rough and scurfy. The absence of viscidity in *T. terreum* is, however, the point to which attention must be directed. The spores are white, broadly elliptical, 4 to 5 μ broad by 6 to 7 μ long.

The species is frequent in woods of deciduous trees, but is also found in pine woods. About Boston it is, apparently, not so common as *T. portentosum*, at least it is not so often collected.

ERRATA.

Page 12, line 5; *for* Wissentliche *read* Wissenschaftliche.
" 47, " 3; " var. " forma.
" 80, " 5: " generally " genera.
" 85, " 27; " Nuttal " Nuttall.
" 87, " 1; " ANGUSTIFOLIA " angustifolia.
" 100, " 38; " De. Ton. " De Ton.
" 109, last line; " 1899 " 1889.
" 164, line 6; " cm. " mm.
" 174, " 38; " Harbor by Mr. C. F. Grover *read* Ossipee by Mr. F. O. Grover.
" 188, last line; for 38 *read* 138.
" 190, line 29; *for* from *read* remote from.
" 196, line 24; " charactetistic *read* characteristic.
" 198, lines 13 and 23; for *ideaus* read *idaeus*.
" 212, last line; for *Vol. 1* read *Vol. 2*.
" 215, line 36; for *Rhyncospora* read *Rhynchospora*,
" 220, " 15; " *Daenstedia* " *Dennstaedtia*.
" 225, " 5; " shrubbery " shrubby.

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C. E. Faxon, del.

THALICTRUM CONFINE, nov. spec.